DOCUMENT RESUME

ED 034 019 VT 007 747

AUTHOR	Kay, Evelyn R.
TITLE	How to Make an Inventory of High-Level and Skilled Manpower in Developing Countries. International Labor Statistics Manual, Report No. 331.
INSTITUTION	Bureau of Labor Statistics (Dept. of Labor), Washington, D.C.
Pub Date	68
Note	116p.
EDRS Price	EDRS Price MF-$0.50 HC-$5.90
Descriptors	Bibliographies, Classification, Developing Nations, *Information Seeking, Labor Supply, Literature Reviews, Manpower Needs, *National Surveys, Occupational Surveys, *Professional Personnel, Questionnaires, *Skilled Workers, *Techniques

Abstract

Techniques are described in detail for estimating current levels of skilled manpower. Specifically, the techniques facilitate obtaining an occupational composition pattern for each economic activity, that is, a count of the number employed in each occupation or occupational group in the current, or base, year. The techniques are: (1) clarify the ultimate purposes of the inventory, (2) study the goals of the economic development plan in the country, (3) prepare a tentative list of occupations, (4) locate available statistical information, (5) prepare a manpower inventory from secondary sources, and (6) conduct a survey of employing establishments. The techniques discussed in this manual are drawn primarily from experiences of manpower consultants who assisted other countries in making inventories of high level and skilled manpower. A summary of these techniques is appended. A related manual is available as ED 022 006. (CH)

Report No. 331

INTERNATIONAL LABOR STATISTICS MANUAL

ED034019

HOW TO MAKE AN INVENTORY OF HIGH-LEVEL AND SKILLED MANPOWER IN DEVELOPING COUNTRIES

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

VT007747

1968

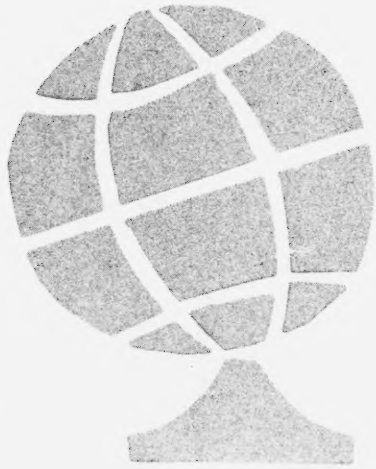
U.S. DEPARTMENT OF LABOR
Willard Wirtz, Secretary

BUREAU OF LABOR STATISTICS
Arthur M. Ross, Commissioner

Other BLS international labor statistics manuals:

BLS Report No.:

248 The Forecasting of Manpower Requirements (1963)
263 Conducting a Labor Force Survey in Developing Countries (1964)
283 Computation of Cost-of-Living Indexes in Developing Countries (1964)
302 How to Establish Current Reporting of Employment, Hours, and Earnings in Developing Countries (1966)



VT 007747

Preface

This manual is one of a series prepared by several Bureaus of the U. S. Department of Labor for the Agency for International Development. The first manual of this series, Manpower Programs and Planning in Economic Development (1959, revised 1963), focused attention on the significance of manpower programs for economic planning in developing countries. It dealt primarily with the general problems of getting a manpower program under way and with the information and administrative machinery needed to plan and carry out such a program.

Subsequent manuals in the series dealt with specific techniques for use by statisticians in carrying out a manpower program in developing countries. For example, the manual, Techniques for Determining Manpower Skill Needs and Training Requirements, describes the methods for determining current skill needs by area and for introducing a continuing program of manpower reporting. Another manual, The Forecasting of Manpower Requirements, describes the techniques used to project manpower requirements by occupation and industry and to estimate future training requirements for high-level occupations.

Basic to applying survey methods and forecasting techniques described in these latter two manuals is the need for current information on the number of people in certain occupations. For example, data on current levels of employment (or availability for employment) of high-level and skilled personnel are needed as benchmarks to be used in estimating future occupational needs by industry and to plan educational facilities to satisfy these needs.

This manual is designed to provide assistance on the initial problem of estimating current levels of skilled manpower. More specifically, it attempts to describe in detail the techniques required to perform one of the steps discussed in The Forecasting of Manpower Requirements. Stage 1 of step 4 on page 48 of that manual states:

> Obtain for each economic activity an occupational composition pattern; i.e., a count of the number employed in each occupation or occupational group in the current or base year....

The techniques discussed in this manual are drawn primarily from experiences of manpower consultants who assisted other countries in making inventories of high-level and skilled manpower. A summary of these techniques appears in appendix A. These experiences will serve as examples of what can be done in a developing country with no prior inventory on hand.

This manual was prepared in the Bureau of Labor Statistics by Evelyn R. Kay, under the general supervision of Matilda R. Sugg, Office of Foreign Labor and Trade.

Contents

Page

Chapter 1. Introduction and general procedures 1
- Clarify the ultimate purposes of the inventory 2
- Study the goals of the economic development plan in the country 3
- Prepare tentative list of occupations 4
- Locate available statistical information 4
- Review materials collected 5
- Further action 5

Chapter 2. Occupations--concept and classification 6
- Concept of occupation 6
  - Distinction between occupation and industry 6
  - Distinction between occupation and education 7
- Occupational classification system 7
  - Characteristics of an occupational classification system 8
  - Main parts of an occupational classification system 8
  - Definitions 8
  - Titles 8
  - Numerical codes 9
- Adaptations of the ISCO 9
- The example of India 11

Chapter 3. Selection of occupations to include in the inventory 12
- Criteria for selecting occupations 12
  - Occupational title 12
  - Education or special training required 13
  - Significance to economic development plan 15
- Determine priority occupations 16
- Importance of classes B and C occupations 17

Chapter 4. Sources of manpower information 19
- Census of population 19
- Labor force sample surveys 20
- Migration statistics 21
- Industrial census 22
- Periodic surveys of establishments 24
- Special surveys of establishments 25
- Employment service offices 25
- Universities and training institutions 26
- Government employment statistics 27
- Regulatory agency statistics 28
- Licenses and registration boards 28
- Franchise and tax records 28
- National rosters 29
- Professional societies and trade unions 29
- Social, health, and unemployment insurance plans 30
- Armed forces 31
- Other sources 31

Contents--Continued

Page

Chapter 5. Preparing the manpower inventory from secondary sources . . . 32
  Examine data from each source 32
  Classify data 32
  Tabulate data 33

Chapter 6. Conducting a survey of establishments 38
  Obtain cooperation among all sectors of the economy 38
  Plan publicity campaign 38
  Contact representative groups in the economic sector 38
  Recruit and train the interviewers 39
  Develop a timetable 39
  Determine specific data to collect 40
  Define scope of investigation 41
    Geographic coverage 41
    Economic activity coverage 41
  Determine the benchmark 43
  Develop a list of establishments 44
  Select a sample of establishments 44
    Cutoff method 45
    Quarter system 48
    Other country experiences 49
  Prepare employment estimates 50
  Prepare questionnaires 54
    Identifying information 54
    The questions 54
    Instructions 55
  Test the questionnaires 55
  Conduct interviews 56
  Process returns 56
    Logging 56
    Editing 57
    Professional reviewing 57
    Classifying 57
    Coding 58
    Tabulating data 58
  Estimate employment 59
  Analyze data and publish findings 59

Appendixes:

  A. Review of occupational surveys in different countries 61
  B. International standard industrial classification of all economic activities--list of divisions and major groups 73
  C. International standard classification of occupations: major, minor, and unit groups 75

Contents--Continued

Page

D. Occupational classification system suggested for use in making high-level manpower assessments 78
E. Number and percent distribution of professional and administrative occupational groups in selected countries 81
F-1. Sample questionnaire--personal interview survey 84
F-2. Sample questionnaire--mail survey 88

Bibliography 97

Worksheets:

1. Tabulating data from secondary sources 34
2. Selecting a sample from list of establishments in one industry . 46
3. Preparing estimates of employment from cutoff sample system . . . 51
4. Preparing estimates of employment from quarter sample system . . 53

Tables:

1. Examples of occupations and educational requirements in high-level and skilled occupational categories 14
2. Years of school completed by experienced labor force in selected occupations, United States, 1960 15
3. Scientists and engineers admitted to the United States as immigrants, by country or region of birth, fiscal years 1962 and 1963 23

How to Make an Inventory of High-Level and Skilled Manpower in Developing Countries

Chapter 1. Introduction and General Procedures

An inventory of high-level and skilled manpower is a count of persons who are employed in occupations requiring many years of education, training, or experience. Some inventories may be simply aggregates of the total stock in the country; others may be more detailed and include the occupations of all those employed, classified by economic activity, educational attainment, age, sex, and other characteristics. Most inventories are somewhere between these two extremes.

Since the manpower situation and the readily available sources and types of data are not alike in any two countries, the pattern of steps involved in making inventories is different from country to country. It is not possible to predict all the various approaches that a statistician may take.

The depth of the study and the procedures for constructing an inventory must be tailored to fit the situation existing in each country. Although lessons may be learned from the experiences of other countries in measuring the number of people at various skill levels, the methods are not always clear cut or easily transferable. A number of factors, which have a direct bearing on the techniques that may be adapted must be taken into account. Such factors include the purpose of the inventory; the availability of time, money, and personnel for carrying out the inventory; and the quality of existing information. The degree of cooperation by government agencies and private employers may also influence the method used for making an inventory.

In preparing this manual, about 50 manpower reports were analyzed. (See appendix A.) These reports were prepared by AID manpower consultants and by experts from ILO, Ford Foundation, several universities, and other organizations. In nearly half of the reports, high-level manpower inventories were based upon information obtained from secondary sources; that is, from records of universities and training institutions, censuses of population, labor force surveys, and licensing and registration records. However, in almost every case, the manpower consultant stated that information from these sources was "inadequate," "unreliable," or "too fragmentary."

Because of these inadequacies, and perhaps because of the improvement in manpower research techniques, most of the recent (since 1962) manpower inventories made by AID consultants and other experts were supplemented by surveys of employing establishments. Assuming the availability of time, money, and personnel, there are distinct advantages in conducting an establishment survey for estimating high-level and skilled manpower. By going directly to the source of employment, reliable and factual information can be obtained. Manpower consultants appear to have had success with this method, and most recommend further periodic surveys in order to obtain a continuing series for measuring changes in the occupational composition of industries.

This manual traces the various steps that may be required to complete a manpower inventory, including a description of an establishment survey. Not all steps will be necessary in each situation, but they are described to enable the consultant to follow the logic of the procedures. Before setting forth detailed procedures for making a manpower inventory, it is worthwhile to consider the process as a whole. The remainder of this chapter outlines the major considerations in making a high-level and skilled manpower inventory.

Clarify the Ultimate Purposes of the Inventory

Since the ultimate purpose of the inventory influences the kind of manpower information to be collected, a manpower consultant first should determine how the information is to be used. A clarification of the ultimate use also enables the manpower consultant to define the scope of investigation within the framework of the available time and money. The following uses of manpower inventories emphasize the need for information on high-level and skilled manpower:

1. To determine whether the economic goals described in the country's economic development plan will provide a sufficiently strong program to support all those who want work or, conversely, whether enough skilled workers will be available to accomplish the goals of the development plan.

2. To serve as a benchmark for making projections of each occupation for which many years of education and training are required.

3. To identify those occupations among the professional and skilled groups for which there is now or will be a manpower shortage or surplus.

4. To aid in planning the expansion of education and training facilities and the curricula needed to train young people for high-level occupations.

5. To provide guidance for establishing on-the-job training and apprentice training programs to develop middle-level skills.

6. To provide guidance to industrial establishments for planning future capital investments; policy regarding recruitment, training, salary levels; and utilization of professional, technical, and skilled personnel.

7. To guide young people in making vocational choices.

8. To provide guidance in establishing national policy on manpower matters, such as use of services of foreign nationals, financial aid to qualified students, and the role of the military establishments.

A manpower inventory that is to be used for purposes of developing high-level and skilled manpower would include all occupations requiring education and training. In general, high-level manpower designates those people in the labor force who are in occupations such as engineer, teacher, economist, and manager. Skilled manpower includes workers who have the manual skills necessary for the modern economy in occupations such as machinist, repairman, plumber, and other skilled occupations.

In addition to providing information on high-level and skilled manpower for the purpose of skill development, an inventory may also be useful in general manpower planning and economic analysis in a developing country. An inventory for these purposes requires that the scope of the investigation be broadened to include information on occupations at all skill levels, not just high-level occupations. Information covering the entire range of occupations provides the necessary data for discerning occupational patterns among the various economic activities. These patterns are the bases for making occupational projections.

The techniques described in this manual emphasize high-level and skilled manpower, primarily because most developing countries are interested in this area. However, the methods can be easily adapted to include all occupations, so that occupational distribution patterns among various industries can be determined.

Study the Goals of the Economic Development Plan in the Country

Economic development plans in most developing countries provide information on the direction toward which the country is expending its efforts. These plans usually discuss (1) the types of industrial activities that the country expects to introduce into the economy and (2) the rate of expansion of existing activities. Some mention may be made of the amount of labor available for carrying out the economic plan or of the educational programs for developing the required manpower. However, in most cases, manpower information contained in the plan is not detailed enough to allow for analysis of specific occupations or classes of workers.

Despite the lack of adequate manpower information in the economic development plan, the manpower consultant should be guided by the goals of the plan. Industrial and construction projects (e.g., dams, electric power plants, etc.) that the country hopes to develop or expand should be taken into consideration when selecting occupations for a manpower inventory. It is important that occupations be cross-classified by industry in order to integrate the inventory with the economic development plan.

Prepare Tentative List of Occupations

Discussion with local manpower specialists and with large employers, and review of various manpower documents should give the statistician some idea of the types of occupations that may be included in a high-level manpower inventory. The tentative list should include the major professional occupations which require long years of education and/or training and which are needed in the modern economy. Also included should be subprofessional and skilled (i.e., middle-level) occupations which require fewer years of formal training or many years of experience. In short, the statistician should seek data on as many types of occupations as he considers essential for the advancement of the country's economic development plan.

A review of the various manpower reports indicates that no set pattern emerges on the kinds of occupations included in the inventories. Generally, the number or types of occupations were determined by the amount of time, money and staff available to the manpower consultant. If resources were very limited, inventories covered only selected occupations which were known to be in short supply or for which information was readily available. An AID study in Liberia, 1/ for instance, covered 25 major occupations of various skill levels for which an immediate need was felt--from university-trained engineers to stenographers. In other studies, manpower inventories just counted the number of people who had received a degree from a university.

Chapter 2 discusses some of the concepts and definitions of occupations and chapter 3 provides some guidelines for selecting occupations for inclusion in an inventory.

Locate Available Statistical Information

A thorough search should be made for records, reports, and other statistical and reference materials relating to manpower which were prepared by government agencies, international organizations, nonprofit agencies, and predecessor AID manpower consultants. These documents must be carefully examined to ascertain consistency and comparability among the various aspects of manpower. Chapter 4 describes the possible sources of occupational information. The availability of these sources determines, in part, the types of occupations to include in an inventory, and the method of collecting data for the inventory.

It is rare, indeed, to collect enough information from secondary sources to develop a realistic inventory. Although some earlier inventories of high-level manpower were based solely on information obtained from secondary sources, these soon proved inadequate. In most cases, these inventories were only reports of the total output, by specialty, of universities; they excluded people actually employed in high-level occupations who may have received their education from a foreign university or who may not have had

---

1/ William A. Langbehn, A Pilot Survey of High-Level Manpower in Liberia, Agency for International Development, September 1961.

formal qualifying education. In more recent years, inventories of high-level manpower have gone beyond the mere reporting of university output to include employment by occupation and industry, regardless of education received. Manpower consultants assigned to developing countries agree that, in order to fill in gaps or to support tentative conclusions, secondary sources inevitably need to be supplemented by establishment surveys or sample studies of high-level and skilled manpower employed in the modern sector of the economy.

Review Materials Collected

So far, it has been recommended that the statistician study reports and reference materials, talk to available manpower specialists, and search for statistical data. He should stop at this point to take a careful look at the information collected. An examination of the available information may reveal that many of the statistical sources are inadequate or statistically unreliable. But data, and even impressions, however rough, will nevertheless form the basis for all subsequent action. The methodology for making manpower inventories that the statistician eventually recommends may vary considerably depending on the results of his analysis of the current situation. Chapter 5 discusses a method of using secondary source materials to make an inventory and outlines some of the problems and inadequacies involved.

Further Action

The general conclusion resulting from a composite of the experiences of manpower consultants seems to be that secondary source materials alone do not supply enough information for making an adequate manpower inventory. Further steps are necessary to obtain the best possible information about the country's current high-level and skilled manpower status by occupation.

About the only reasonably reliable method of obtaining additional information is to conduct a survey of employing establishments. The feasibility of surveying employers to make an inventory of high-level manpower is based on the following assumptions: (1) since, in most developing countries, people with skills or training are scarce, they are all employed; and (2) government, educational institutions, and establishments in the modern sector of the economy are the major employers of such workers. With these assumptions, the statistician can accomplish his project of making an inventory of high-level and skilled manpower by surveying a sample of these employing establishments. Techniques of making a sample survey of establishments are described in chapter 6.

It should be remembered that the inventory is not an end in itself. Ultimately, it will be followed by further statistical manipulation for manpower forecasting and educational planning. The inventory is only the basis for a more precise program of action.

Chapter 2. Occupations-Concept and Classification

An essential tool in making an assessment of the current levels of skilled manpower is an occupational classification system. The following is a discussion of the generally accepted meaning of occupation and a description of the international system of occupational classification.

Concept of Occupation [2]

An occupation designates the usual type of work performed by an individual. It may be defined in terms of the combination of duties, tasks, and functions performed. It is his trade or profession, regardless of the industrial sector or economic activity in which he may be employed or the type of training he received. For example, a typist may work in a government office, a wholesale firm, or a lawyer's office; occupationally, she remains a typist as long as she does the same kind of work. If her principal duties should change to those of a bookkeeper, either in the same office or with a new employer, she can no longer be classified as a typist. As soon as her tasks--the work she customarily performs--have changed substantially, her occupation has changed. The fact that she may or may not have changed employers has no bearing on her occupation.

Distinction Between Occupation and Industry. It is important to distinguish between an occupation and an industry. The concept of an occupation is related to what the individual is doing; the concept of an industry is concerned with what all the individuals, collectively, in one location (the establishment) are doing. For example, people with many different occupations and skill levels are needed in establishments which produce cloth: designers, spinners, weavers, repairmen, purchasing agents, salesmen, typists, bookkeepers, etc. Individually, each person performs his own specific set of duties; hence, each person has his own well-defined occupation. Collectively, these individuals combine their efforts in one establishment to achieve the purpose of their association: to produce cloth. The production of cloth represents the economic activity or industry of that particular establishment.

All establishments engaged in the same or similar lines of economic activity (producing cloth, in the example above) make up an industry grouping. In order to identify these establishments in their appropriate industry sectors, it is recommended that countries follow the International Standard Industrial Classification system. [3] A list of the recommended industry divisions and major groups of industries is provided in Appendix B.

---

[2] See Sten-Olof Doös, "Forecasting Manpower Requirements by Occupational Categories," Planning Education for Economic and Social Development, (Organisation for Economic Co-operation and Development, Paris, 1962), p. 124 ff.

[3] United Nations, Statistical Office, Indexes to the International Standard Industrial Classification of All Economic Activities, Statistical Papers, Series M, No. 4, Rev. 1, Add. 1 (New York, 1959).

Distinction Between Occupation and Education. In collecting data for occupational inventories, it is also important to differentiate between occupation (duties performed) and education and training received. A person may be trained or educated in one area of specialty but actually working in another field. For example, a man trained as an automobile mechanic but employed as a taxi driver is, occupationally speaking, a taxi driver. It is the actual work performed that determines his occupation, not what he is trained for or is capable of doing.

The distinction between "employed as" and "trained as" becomes especially sensitive in occupations which usually require university degrees. Some people in the occupation of engineer do not have the education of an engineer; they may have a university degree in physics or mathematics, or they may have been promoted from the ranks of skilled workers without any additional formal education or training. On the other hand, persons with an engineering degree do not always take jobs as engineers, but utilize their engineering education to take quite different occupations, such as salesmen, teachers, or managers. Educationally speaking, they are engineers; but occupationally, they must be classified according to the type of job they hold.

For the purposes of a manpower inventory, this distinction becomes important since different occupational totals may result depending on the source of information. If the investigation is based mainly on university reports of the number of graduates in certain specialities, the totals will reflect only the "trained as" engineers. While this may be sufficient for some manpower studies, it will not provide a true picture of the total number of people who are "employed as" engineers. (See further discussion on page 13.)

Occupational Classification System

Devising an occupational classification system requires time and personnel with specialized training in analyzing job content. Fortunately, the research into occupational classification has already been carried out at the international level. This work greatly facilitates the task of developing a system suitable for the particular needs of a country.

The International Standard Classification of Occupations (ISCO) 4/ was developed by the International Labour Office to provide a basis for the international comparison of occupational data and to give guidance to countries wishing to develop or improve their systems of occupational classification. (See appendix C.) The use of ISCO as a guide in the development of a national system does not mean that the national system becomes identical

---

4/ International Standard Classification of Occupations (International Labour Office, Geneva, 1958). Proposed revision of ISCO for use in the 1970 Census of Population appears in Revision of the International Standard Classification of Occupations, Eleventh International Conference of Labour Statisticians, Report III and Draft Definitions, Appendix II (International Labour Office, Geneva, 1966).

with the international system or that the international system can be considered a suitable substitute. Each national system must be adapted to work practices and nomenclature of each country. [5]

Characteristics of an Occupational Classification System. A national occupational classification system which is effective for purposes of making manpower inventories, and consequently for planning and implementing manpower programs, has the following characteristics:

1. All occupations in all economic activities are included in the classification system.

2. The system classifies both work performed (occupations) and those who perform, or who are qualified to perform, the work (individuals).

3. The basic units of classification are grouped according to related work-performance qualifications; for example: all physical scientists are grouped together.

4. The classification system can be used not only for manpower planning but for employment service functions, population and industry censuses, vocational training requirements, employers' reports, etc.

5. It makes possible international comparisons of occupational data.

Main Parts of an Occupational Classification System. A national occupational classification system, based on the ISCO, consists of three elements: definitions, titles, and codes. Each fulfills a specific purpose. Since they are interdependent, an occupational classification system is not complete until each element has been developed.

Definitions. The definition is a short description of the work customarily performed in the occupation, how and why it is done, and something of what is involved in doing the work. The definition is a composite obtained from information about a number of similar occupations in different areas, establishments, and industries of a country, taking into account the major duties which these occupations have in common. Individual job variations are not reflected in the definition; however, job variables are often listed as supplementary information to the standard definition.

Titles. The title of an occupation is the name by which a specified set of duties is known. Although a title may be in common usage, the exact duties of that occupation may vary among countries, industries, or localities.

---

[5] Two examples of national dictionaries that are based on the International System of Occupational Classification are:
1. Diccionario Nacional de Ocupaciones, (Republica de Venezuela, Ministerio del Trabajo, Caracas, 1965). 561 pp.
2. Standard National Classification of Occupations, (Government of British Honduras, Labour Department, Belize City, 1965). 186 pp.

Therefore, titles are useful for reference purposes only and cannot take the place of definitions. Identification of types of workers must be made by referring to the definitions.

Numerical Codes. The structure of the classification system is formed by grouping occupations on the basis of similarity of worker-performance requirements. In the international classification structure, all civilian occupations are divided into 10 major groups; members of the armed forces and unclassified workers are in separate groups. The major groups are divided into 73 major groups; these in turn are subdivided to make up 201 unit groups. Finally, the unit groups are subdivided into 1,345 occupations. The following is a list of the major groups: 6/

Code Number	Major Groups
0	Professional, technical, and related workers
1	Administrative, executive, and managerial workers
2	Clerical workers
3	Sales workers
4	Farmers, fishermen, hunters, loggers, and related workers
5	Miners, quarrymen, and related workers
6	Workers in transport and communication occupations
7/8	Craftsmen, production-process workers, and labourers not elsewhere classified
9	Service, sports, and recreation workers
X	Workers not classified by occupation
----------	Members of the Armed Forces

Adaptations of the ISCO

The problem of adapting the ISCO to individual country situations is one of the major concerns of all countries involved in making an occupational manpower inventory. Any adaptations that must be made should be determined by the purpose of the project. If the manpower inventory is to be used as a gauge for estimating training or educational requirements, the occupations should be categorized according to educational requirements. For example, in Major Group 0 (Professional, technical, and related workers), some occupations require at least 4 years of university training; some, 2 years of post-secondary school training; and other occupations in this group require no advanced training. Since data gathered for the major group as a whole would be misleading for educational planning purposes, some kind of breakdown in this category is necessary.

6/ See appendix C for listing of the 73 minor groups; and refer to ISCO (op. cit.) for the unit groups and occupations.

One of the most useful adapations of the ISCO was developed in 1960 by Professor Harbison and expanded in 1962 by Professor Parnes for use in the Mediterranean Regional Project. [7] The main purpose of this project was to assess future educational needs in the light of long-term targets for economic and social development. Part of the work in the project consisted of making inventories of skill levels of the current supply of manpower. In order to adapt the ISCO to accommodate the needs of the project, the various occupations were categorized according to the number of years of education and training required to qualify for the occupation.

The 1,345 occupations listed in ISCO were fitted into four broad categories, grouped by educational levels: [8]

Class A. All occupations for which a university education or an advanced teachers college degree or its equivalent would normally be required. The occupations are further subdivided into (1) those that normally require scientific or technical education, such as engineer, chemist, physician, and university science teacher; and (2) those that normally require general academic education, such as administrator, manager, accountant, economist.

Class B. Occupations for which 2 or 3 years of education or their equivalent beyond the secondary level (12 years) may be required, such as technician, draftsman, nurse.

Class C. Occupations for which a secondary school education (either technical or academic) or its equivalent would normally be required, such as clerical worker, skilled manual worker, sales worker.

Class D. All occupations not included in Class A, B, or C, such as farmer or unskilled manual worker.

Practically all manpower inventories prepared since 1960 have utilized this occupational grouping. Some minor adaptations may have to be made based on the particular manpower situation within a country; but, by and large, this grouping by educational levels may be used in the form presented here.

---

[7] Herbert S. Parnes, Forecasting Educational Needs for Economic and Social Development, (Organisation for Economic Co-operation and Development, Paris, 1962), 113 pp. The countries involved in the Mediterranean Regional Project were Greece, Italy, Portugal, Spain, Turkey, and Yugoslavia.

[8] See appendix D for detail listing of the occupations classified into these four groups.

The Example of India

When India initiated its studies of occupational patterns in manufacturing industries, 9/ it was faced with the problem of classifying all occupations in all manufacturing industries. The object was to study the proportion of each occupation in relation to total employment in the industry--rather than try to identify numbers of trained people (whether employed or not) in each high-level occupation, as in the OECD Mediterranean Regional Project. In the early stages of the Indian survey, it became necessary to devise more precise definitions in its National Classification Scheme (which is based on the ISCO) in order to identify occupations "where explanation seemed called for by virtue of some ambiguity in the nomenclature . . . or in respect of the work-content of the occupations." 10/

For example, in Minor Group 0-0 (Architects, engineers, and surveyors), it seemed clear enough, to those conducting the survey, to include in this group all engineers who possess a degree or a diploma. However,

> a great deal of difficulty was encountered in classifying some occupations like foreman and technical superintendent in the engineering industries, since the actual qualifications of these persons were not available nor was there any clear understanding of the work-content. However, on the basis of general appreciation of the situation, it was decided to treat foremen and technical superintendents in the following industries as engineers: (1) iron and steel: primary products,(2) iron and steel: secondary products, (3) aluminum, brass, and copper: secondary products, (4) general engineering and electrical engineering, (5) automobiles and coach building,(6) shipbuilding and repairing,(7) aircraft manufacturing and repair services, and (8) railway wagon manufacturing. 11/

9/ Pitambar Pant and M. Vasudevan, Occupational Pattern in Manufacturing Industries, India 1956, (Planning Commission, Scientific and Technical Manpower and Perspective Planning Division, Delhi, 1959). 448 pp.

10/ Ibid. p. 432.

11/ Ibid. p. 433.

Chapter 3. Selection of Occupations to Include in the Inventory

Exactly which occupations should be included in a high-level and skilled manpower inventory requires very careful consideration. The manpower consultant should first evaluate the extent of his resources (time, money, and staff) in terms of the ends he wants to accomplish. An attempt to assess all high-level and skilled occupations may be a lengthy and costly process and may not be absolutely necessary for the purposes of the study. Because of the expense involved, the choice of specific skills may be limited to those occupations in which critical shortages are evident. Once the economic factors are taken into account, the following guidelines for selecting high-level and skilled occupations for an inventory may be considered.

Criteria for Selecting Occupations

The selection of occupations requires a knowledge of the economic development plan of the country as a whole and the plans of major economic activities. The manpower consultant should rely on the advice provided by government personnel and industrial establishment administrators. When the prospective plans are considered, a determination that significant occupations belong in a high-level and skilled manpower inventory may be based on the following criteria: occupational title, the amount of education or special training required, or the significance of the occupation to the economic development and industrial plans. Depending on the particular situation and the country, other criteria may also be established. The following sections discuss the major criteria.

Occupational Title. The selection of occupations to be considered high-level may be guided by the descriptive occupational title or activity. However, great care must be used in making a selection according to titles alone. It is important to note that, although the same titles have been used for some occupations for a long time, they do not always denote the same levels of skills. The designation of engineer is one example of an occupational title that often overstates the duties involved. In some countries, the title is applied to anyone who works with machinery or who maintains the heating plant in an apartment building, for example. An analysis of the actual job performance in these cases would probably indicate that these workers are more likely to be machine-tool operators,in the first situation,or janitors, in the second. The title of engineer, in these cases, may have been fostered by the employer in lieu of more wages, or adopted by the worker to upgrade himself when responding to a census or labor force survey.

The opposite situation may also occur. As a consequence of technological development, there may be continual change in occupational duties of certain jobs, but not necessarily in titles. Many occupations found in modern industry have retained the same titles over a period of years despite the changes in job content. For example, traditionally, the title of blacksmith is applied to men who shape metal to form shoes for horses; in modern industry, the job of blacksmith has evolved into a highly skilled maintenance and repair occupation in the manufacturing and petroleum extraction industries.

Obviously, training requirements for the job of blacksmith in the traditional society are different from those in the modern society. Therefore, when selecting occupations for inclusion in an inventory, it is necessary to investigate the job content of occupations rather than relying on titles alone. The job content will also be a clue as to the level of skill and will help determine whether that level should be included in the inventory. A comparison of wages or earnings scheduled for the same occupational title in different industries or establishments in the same industry may also help to indicate the level of skill.

Education or Special Training Required. In making an intelligent selection of occupations for inclusion in an inventory, a significant criterion is the level of formal education and or training that is typically associated with the occupation. 12/

Some of the problems of identifying and matching job titles with levels of educational requirements were discussed in chapter 3 under the section, Adaptations of the ISCO. Following the system of categorizing occupations by levels of education, table 1 indicates the types of occupations that are found in the high-level and skilled groups. Since it is assumed that occupations requiring little education or specialized training can be filled without difficulty, Class D occupations are usually omitted from high-level and skilled manpower inventories.

An inventory of skilled manpower does not necessarily have to include all occupations in each of the three groups. The detail in which occupations are selected may range from the very general(that is, all professional technical occupations) to the very specific (engineers, by specialty and function). The amount of detail depends on the purpose of the survey, the degree of detail of the basic data, and the time and money allocated to make the investigation. Some statisticians hesitate to be too specific, feeling that general information is sufficient. But, for many purposes, such as planning educational programs and facilities and providing vocational guidance, studies that are too general conceal real differences among occupations.

In practice, there is not necessarily a systematic relationship between training received by an individual and his actual career. (See discussion in chapter 2, page 7.) By definition, an occupation relates to the type of work usually performed by an individual, no matter in which industry he works and, in principle, no matter what kind of training he has received. Some occupations are homogeneous from they point of view of instruction and training required for them (such as physician); others are quite heterogeneous. In this latter category, it is very difficult to establish rigid links

---

12/ Both ILO and OECD recommend the use of educational attainment as the means of identifying levels of occupations. See ILO Report of the Meeting of Experts on the Assessment of Manpower and Training Requirements for Economic Development, 7th Item of Agenda (Geneva,1-12 October, 1962), p. 19.

Table 1. Examples of occupations and educational requirements in high-level and skilled occupational categories

Occupational categories	Typical occupations	Educational training requirements
Class A: Professional		
1. Scientific and technical	Engineer, chemist physician.	at least 16 years of education and/or training.
2. Other Class A	Manager, administrator, teacher, lawyer, economist, statistician.	
Class B: Subprofessional	Technician, draftsman, laboratory assistant, nurse, primary school teacher.	at least a secondary education (12 years) plus 2 years of technical or vocational education or their equivalent.
Class C: Clerical, sales, and skilled manual (craftsmen)	Secretary, sales worker, machinist, tool and diemaker, all maintenance workers.	at least a secondary education or its equivalent.

between educational attainment and occupation. This is evident in broad categories of occupations, such as sales personnel and clerical workers. Even in specific occupations, such as engineer, nurse, or economist, in which certain levels of education are usually required, there is a wide distribution of educational attainment.

Table 2 illustrates the broad range of formal education actually acquired by the experienced labor force in selected occupations in the United States. In 1960, more than half of the mechanical engineers and nearly three-fourths of the chemists and economists had completed 4 years or more of college. Although these occupations are usually associated with university degrees, a fairly large portion of the people in these occupations never had entered college. Similar comparisons may be made with the remaining occupations in the table, which usually require at least a high-school education (12 years).

The data in table 2 are indicative only of the formal educational attainment of incumbents of occupations; it does not relate to the educational requirements of the job. In addition, the table does not indicate the amount of experience or on-the-job training that was acquired in order to qualify for the job. Actually, these workers probably underwent many years of work experience and on-the-job training which are not reflected in these data.

Table 2. Years of school completed by experienced labor force in selected occupations, United States, 1960
(Percent distribution)

Selected occupations (male, except as noted)	Total	Primary school (1-8)	High school		College		Median
			1-3 (9-11)	4 (12)	1-3 (13-15)	over 4 (16 or more)	
Engineer, mechanical....	100.0	5.0	6.6	15.7	18.9	53.8	16.1
Chemist.................	100.0	2.1	3.1	10.6	13.8	70.4	16.6
Economist...............	100.0	1.1	2.1	10.0	13.8	73.0	16.8
Draftsman...............	100.0	2.4	9.7	42.4	35.2	10.3	12.9
Nurse (female)..........	100.0	4.2	9.4	33.2	39.8	13.4	13.2
Technician, electric and electronic........	100.0	4.0	14.3	45.8	31.3	4.6	12.7
Manager, office (mfg.)..	100.0	8.8	13.5	27.0	21.1	29.6	13.1
Stenographer (female)...	100.0	2.0	10.3	65.8	19.1	2.8	12.6
Mechanic and repairman..	100.0	37.4	27.3	28.3	6.0	1.0	10.4

Source: U.S. Census of Population 1960, PC(2)7A, Final Report, "Occupational Characteristics," 1963, table 9.

Significance to Economic Development Plan. Another consideration in selecting occupations for an inventory is their significance to the economic development plan. Most of the high-level manpower reports that were reviewed for this manual limited their studies to those occupations which were considered strategic to economic growth and/or to the attainment of sociopolitical objectives. In this type of survey, it is necessary to go down the list of occupations in the country and select those that are considered "critical" for the particular objectives. In general, the occupation should contribute to the performance of an activity judged essential in the country's development. 13/

13/ Strict adherence to this statement may exclude some occupations, such as archeologist or art historian. However, people in these occupations or with these skills may be included in a high-level manpower inventory since they could easily transfer to occupations, such as teaching, which are essential for fulfilling economic development plans.

Some countries, in their effort to improve the physical well-being of their people, concentrate on obtaining the number of physicians, dentists, pharmacists, and other professional medical personnel (from class A1) and the number of nurses, dental assistants, medical technicians, and other medical supporting personnel (from class B). These data can provide the necessary information to compute rates of professional medical personnel per 100,000 population for estimating current need and future requirements. In addition, functional relationships of closely linked occupations (e.g., doctors to nurses, dentists to dental assistants) may provide a clue as to the degree of underutilization of class A occupations.

Other specific occupations or occupational groups may be the focus of attention in economic development plans. For example, some countries want to know the number of managerial and administrative people (from class A2) because of the possible shortage of entrepreneural skills needed to run private and public enterprises planned in the economic development program. Still other countries want to know the number of teachers and other trained personnel available for teaching positions in order to gauge the feasibility of their educational expansion programs.

Many of the more economically advanced countries focus their attention on technically trained personnel. For the past 15 years, Canada, the United States, and various countries of Europe have collected information on engineers, scientists, and their supporting technical personnel in order to prevent or alleviate a shortage in these occupations. These countries have gone beyond compiling aggregate numbers and now break down the totals to show such items as branches of engineering (civil and mechanical), function (teaching, research), and education acquired. These surveys sometimes include engineering aids, technical assistants, technicians, and similar occupations in the class B occupational category. Results from a survey which includes detailed information on occupations can reveal essential data needed to plan educational facilities and to provide vocational counseling. The anticipated growth of scientific and engineering activity in developing countries has stimulated their interest in collecting information on scientific and technical occupations.

Determination of Priority Occupations

A reasonably satisfactory list of occupations may be selected by using the criteria outlined above or other criteria as dictated by the needs of the country. For example, the economic development plan may emphasize the intention to replace foreign nationals with domestic employees in certain occupations. Generally, manpower consultants select high-level occupations which are common to all industries under the assumption that the economic development plan calls for expansion throughout the economy, rather than in a specialized industry. 14/ However, such a basic listing may overlook important occupations that are unique to one industry; e.g., printing trades.

14/ There are exceptions, of course, especially in countries where the most immediate project of the development plan is concerned with the construction and operation of one specific industry, such as electric power.

If a survey of employing establishments is conducted, occupations that were omitted in the basic list may be added by using an open-end questionnaire. This technique permits employers to supply information on occupations important to their establishments.

There are occasions when no special list of occupations need be prepared. Although most manpower consultants limited their investigations to a specific list of occupations, other consultants made no list as such but requested information on all occupations falling within a certain criterion. For example, in the 1959 Uganda establishment survey of high-level occupations, [15] all occupations requiring a minimum of 2 full years of training in order to achieve acceptable performance were included in the survey. In this particular case, it was the responsibility of the manager of the establishment to supply the list of occupations.

It should be pointed out that while the country may be interested primarily in high-level occupations, the statistician should analyze the local situation to determine if occupations other than those normally considered high-level should be included in the inventory. Many AID advisers have raised this question because their investigations have revealed that the most urgent needs of the country were for subprofessional and technical skills to back up the professional workers. Moreover, if the proposed economic program materializes in the specified time, there will be a greater and more demanding need for skilled and semiskilled manual workers. This is especially true if the country is planning large construction projects which require the services of these people.

Importance of Classes B and C Occupations

As indicated earlier, most inventories of high-level manpower are limited to occupations included in the class A category. People in these occupations require a long period of education and/or training; and planning for educational facilities to supply high-level manpower needed in the future also requires much lead time. However, the same situation holds true for the subprofessional category and, in many cases, for the skilled manual and clerical categories. These people, too, need several years of education and/or training to qualify for their jobs. Subprofessional and skilled workers do not materialize spontaneously. Training facilities must be planned well in advance to assure an adequate supply; otherwise, a large number must be imported to supervise and perform many of the office and plant activities.

Furthermore, there is wastage or underutilization of manpower when professional workers perform tasks at lower levels of skill-tasks that should be performed by technicians, aids, and other middle-level personnel. Middle-level workers are frequently overlooked in a survey, and the supply of these workers usually falls far short of the demand. According to Dr. Harbison, 16/ the required rate of net accumulation of middle-level personnel should increase about 50 percent faster than the growth rate of high-level manpower. If the cost involved in adding middle-level occupations to the list is not too great, the statistician should consider very seriously including these occupations. The extra effort may help avoid severe problems not only of short supply in middle-level personnel but also of underutilization of professional personnel which might prove a major hindrance to the economic development plans.

---

[15] Robert L. Thomas, Survey of Manpower and Training in Uganda, Ford Foundation, 1959.

16/ Frederick Harbison, "The African University and Human Resource Development," Studies in Labor and Industrialization, Reprint No. 33 from The Journal of Modern African Studies, (Volume 3, No. 1) 1965, p. 56.

Chapter 4. Sources of Manpower Information

Information from a wide range of sources may be used to make an inventory of skilled and high-level manpower. In developed countries, this information is relatively easy to locate because censuses, surveys, registrations, etc. are usually fairly well established as part of the information-gathering functions of government agencies. In developing countries, only recently has there been an awareness that manpower is a part of economic development, and very little progress has been made by government agencies to gather manpower information. Since many of these countries have no central depository for the manpower information they do have, it takes care and resourcefulness in putting the pieces together to come up with a reasonable estimate of the current situation.

Every piece of data that can be found should be preserved even though it may not appear at first to supply the information required. There is always the possibility of eventual use of even fragmentary data as a device for checking the reasonableness of estimates obtained from other sources. Chapter 5 describes the method of developing an inventory by assembling data from various sources.

The following list of potential sources of information [17] from which to make estimates of high-level manpower is far from complete. It should serve, however, as a checklist and illustrates some of the possibilities to be explored and the need to exert imagination and ingenuity in searching for useful information.

Census of Population

A population census is the basic statistical tool for any manpower analysis since it is a total count of people in a country at one point in time. Statistics on the personal characteristics of the economically active (labor force) and inactive population; such as age, sex, education, geographical location, marital status, etc.; provide indispensable information for analyzing the composition, distribution, and growth of the population and form the basis for estimating the future supply of manpower.

In addition to the personal characteristics of the population, many censuses collect information on the economic characteristics of the labor force. Such information includes the occupational and industrial attachment of members of the labor force. When these data are further cross-classified by age, sex, educational levels, and other personal characteristics, they provide a much clearer picture of the composition and quality of the current labor force. Some countries do not publish detailed occupational and industrial information in their census reports although this information may already be punched on IBM cards. It may be possible for the manpower consultant to request that these cards be rerun to obtain this information.

17/ See also: Occupational Employment Statistics Sources and Data; BLS Report # 305, U.S. Department of Labor (Washington, June 1966).

Usually, censuses occur at regular, but infrequent, intervals of from 5 to 10 years, and the information is often several years old by the time the data are available. A recent census (one that is less than 5 years old) may provide a benchmark against which to measure the accuracy of current estimates derived from other sources. Appendix E provides estimates of the number and percent distribution of professional and administrative occupational groups in selected countries. Most of these data are derived from censuses of population.

Some censuses in developing countries provide data that are of limited use in manpower analysis. Many of the limitations stem from problems of classification and are not necessarily inherent in the census system itself. They are mentioned here only as a precaution against using the data without investigating the concepts. In order to judge the usefulness of the data, the following items should be considered:

1. Concepts of employment and unemployment.

2. Systems of classification, particularly occupational and industrial classification.

3. Comparability of concepts and definitions from one census to another.

Labor Force Sample Surveys

A survey of the labor force 18/ supplies current information about the composition and characteristics of the economically active population. It may be carried out once a year, once a quarter, or once a month, usually by personal interviews conducted in sample households which have been scientifically selected. A labor force sample survey usually provides information necessary to make current estimates of the employed and unemployed and their age, sex, occupation, and industrial attachment. However, because of the error that may result from the use of a probability sample, reliable and detailed occupational estimates, especially by industry and geographical area, cannot usually be developed.

Other items pertaining to socioeconomic aspects of the labor force may also be included, from time to time, in the survey. Supplementary information may include items such as:

1. School enrollment--whether those in the labor force are currently attending school or training institutions.

2. Educational level--the length of schooling or training attained by those in the labor force, expressed in number of years.

18/ See Conducting a Labor Force Survey in Developing Countries, an AID manual prepared by the Bureau of Labor Statistics, September, 1964.

3. Occupational mobility--the current occupation compared with that held, say, a year ago.

4. Internal migration--whether there is movement in the labor force from area to area or from industry to industry.

5. Job held compared with training received--whether the current occupation matches the type of training received. For example, a person trained for the law working as a bookkeeper.

The limitations encountered in using labor force survey data are similar to those found in using census data. Assuming that the sample is well designed and scientifically selected, probably the greatest source of error in estimation arises from misunderstanding concepts and definitions. Other nonsampling errors may arise from interviewer or respondent bias, such as the tendency of the respondent to upgrade his position.

Migration Statistics

Statistics on the movement of people into and out of a country can yield very useful information for estimating numbers of skilled workers. Usually, migration statistics reflect the economic conditions in the country of origin and in the country of destination. For example, in the early 1920's, Norway lost more than half of her engineering graduates, many of them to the United States; in the depression years of the 1930's when unemployment in the United States was serious, many of these engineers returned to Norway. 19/

Large numbers of people moving into a country may be an important source of labor and especially of the skilled workforce. For example, heavy immigration occurs in countries such as Switzerland where immigrant labor represents about 10 percent of the total population and about 25 percent of the labor force. 20/ Germany imports large numbers of workers of various skills from other countries; Sweden has a record of about 10,000 immigrants a year; and Israel has large numbers of skilled immigrants each year.

19/ Harold Goldstein, Methods of Forecasting Demand for and Supply of Scientists and Engineers, Organisation for European Economic Co-operation, (Paris, June 1958), p. 46.

20/ Adolf Sturmthal, Current Manpower Problems: An Introductory Survey, Institute of Labor and Industrial Relations, (University of Illinois, February 1964), p. 48.

In contrast, qualified people leaving a country to take a job in another country contribute to what is called a "brain drain." 21/ Emigration tends to be especially significant when large numbers of students study abroad. For example, of the 7,357 Republic of China students who left for graduate study abroad during the years 1957 to 1963, only 481, or 7 percent, had returned by 1965. 22/ The main problem, according to the report, is that the Chinese scholars were not sure whether they would get suitable work after their return, so they took jobs in the country in which they studied.

Not all governments maintain migration or passport records on the occupations or skill levels of the people leaving or entering the country. In view of this fact, in- and out-migration information must come from other sources. For example, several universities in the Philippines maintain migration records of people in high-level occupations. The Netherlands and Denmark have developed data on net emigration from membership rolls maintained by some of the professional societies. A recent study was made of the employment of high-level employees from Chile working in the United States. 23/

Another possible way of supplementing incomplete migration information is to review immigration statistics of the major countries of destination, such as the United States, Canada, and most European countries. These countries maintain detailed records of immigrants by country of origin and by occupation. Table 3 illustrates the number and percent distribution of scientists and engineers admitted to the United States as immigrants for the fiscal years 1962 and 1963, by country or region of birth.

Industrial Censuses

Occupational information by industry may be obtained as a byproduct of industrial production censuses or annual surveys of industrial production. Guided by United Nations recommendations, many developing countries conduct-

---

21/ Morris A. Horowitz, La Emigracion de Profesionales y Technicos Argentinos, Editional del Instituto Torcuato di Tella, (Buenos Aires, 1962).

22/ Statistics issued by the Republic of China's Ministry of Education, reported in Survey of International Development, Vol. II, No. 10, October 15, 1965, p. 2.

23/ Sergio Guierrez Olivos and Jorge Riquelme Perez, La Emigracion de Recursos Humanos de Alto Nivel y el Caso de Chile, Pan American Union, (Washington, 1965).

Table 3. Scientists and engineers admitted to the United States as immigrants by country or region of birth, fiscal years 1962 and 1963

Country or region of birth	Number	Percent distribution
All countries	10,230	100.0
Europe	5,433	53.1
Austria	83	.8
Belgium	57	.6
Denmark	108	1.0
France	120	1.2
Germany	784	7.7
Greece	172	1.7
Ireland	107	1.0
Italy	140	1.4
Netherlands	192	1.9
Norway	152	1.5
Poland	245	2.4
Spain	61	.6
Sweden	113	1.1
Switzerland	218	2.1
Turkey	179	1.7
United Kingdom	2,078	20.3
Other Europe	624	6.1
Canada	1,159	11.3
Mexico	119	1.2
Cuba	487	4.8
South America	546	5.3
Asia	1,904	18.6
All others	582	5.7

Source: National Science Foundation, "Scientists and Engineers from Abroad, Fiscal Years 1962 and 1963," Reviews of Data on Science Resources, Vol. 1, No. 5, NSF 65-17 (Washington, July 1965), 8 pp., based on tabulations prepared by the Immigration and Naturalization Service, U.S. Department of Justice.

ed an industrial census in 1963. The main purpose of these censuses was to obtain information on the physical facilities of the various industrial plants and their production. Many of the censuses also requested information on the number and types of employees working in these industries. In most cases, the occupational information is in broad categories and not in occupational detail. The results of these censuses were not available in time to incorporate in this manual or to analyze their usefulness in supplying adequate manpower data.

One important product of an industrial census is the master list of establishments that was developed for conducting the census. This list is invaluable to the statistician as a basis for setting up a survey of establishments to obtain information on high-level and skilled occupations.

Periodic Surveys of Establishments

In order to obtain reliable and current employment information, many countries conduct periodic surveys of establishments. 24/ Sample establishments supply current data on the number of employees, the hours they worked, and the earnings they received during a specified period. 25/ Most countries which conduct this type of survey usually require information only on total employment, and production worker (wage earner) employment, without any breakdown for individual occupations. This type of data, while useful for other purposes, is of little value to an occupational survey.

Fortunately, however, establishment reporting systems in some countries request information on selected occupations, especially those requiring long periods of education and training, such as engineer, scientist, and technician. A few reporting systems also request information on skilled manual occupations. Nigeria, Tanzania, and Uganda, for example, in their annual employment and earnings surveys, request information from each establishment on the distribution by major occupational groups and on selected individual skilled occupations. Generally, these surveys include all establishments rather than a sampling and therefore provide a fairly detailed and reliable report. However, definitions of occupations used in these surveys must be compared very carefully with those selected for the high-level manpower survey.

Since employers are in the best position to provide detailed work information about their employees, the occupational data obtained from establishments are likely to be more accurate than those from individuals. Some of the problems arising from population censuses or labor force surveys on the appropriate occupational classification of individuals can be resolved on

---

24/ See How to Establish Current Reporting of Employment, Hours, and Earnings in Developing Countries, an AID manual prepared by BLS, May 1966.

25/ By definition, establishment surveys do not cover the self-employed, unpaid family workers, unemployed workers, or other workers not employed in establishments. Data on these workers must be obtained from labor force surveys or from other sources.

the basis of the employers' more objective knowledge of the work to which an individual is assigned. In addition, occupational employment data may be related to other relevant information, such as occupational earnings and wages, as an aid to occupational classification or identification of skill levels.

Special Surveys of Establishments

Labor statistics offices in many developing countries conduct special one-time surveys of establishments to obtain information on certain aspects of the labor force. The most frequent type of survey relates to occupational wages and salaries for establishing minimum wage rates. Some of these surveys request that establishments supply the total number of workers in each occupation. Although data from the last previous survey may be outdated by the time the manpower consultant arrives in the country, it is possible that such information may serve as a benchmark for estimating current employment in selected occupations. The data may also provide a clue to the occupational pattern within the industry. Even if occupational totals are not available, the consultant can get some idea of the types of occupations found in industrial establishments.

Employment service offices in many countries also conduct special employer surveys to obtain occupational information relating to current vacancies and anticipated requirements. Some of these surveys have been done with the assistance or under the direction of a manpower consultant from various international agencies. Reports of some of these surveys are listed in appendix A.

Employment Service Offices

In addition to conducting special employer surveys, employment service offices frequently maintain records of occupational employment by industry and geographic area. Although these data may have certain limitations, some account of the manpower supply-demand relationship of occupation by industry and by geographic area may be obtained. For example, employment service staff members of the Bangkok-Thonburi area visit employers of 10 or more workers to obtain job orders and other employment information. Depending on the kinds of records maintained, it may also be possible to determine both the occupational qualifications required by industry and the qualifications of workers seeking jobs. Supplemental information from employment service offices may provide broad insight in the field of manpower and human resources on such pertinent factors as:

1. Inducements which may lead qualified personnel who withdrew from the labor force to take up employment again in their specialized occupations.

2. Attitudes of young people toward preparing themselves for careers in specialized occupations.

3. Obstacles to employment of qualified older or handicapped persons who received training in specialized occupations.

Although this type of information does not supply precise measurement of occupations, it is essential for a comprehensive picture of the manpower situation.

In some countries, Great Britain and India notably, the national employment exchanges maintain a special roster of all professional people. Since 1961, Indonesia has a law requiring university graduates to register with the National Employment Service. (See section on national rosters, page 29.)

Universities and Training Institutions

One of the best ways of determining numbers of people who are educated and/or trained for certain occupations which fall under the category of high-level manpower is to look at the records maintained by education and training institutions. University records can reveal the number of graduates in each profession; and technical and vocational schools can supply the number of graduates in subprofessional and skilled occupations.

Many of the recent manpower surveys conducted in developing countries used university and training records as a source for estimating the number of individuals qualified in each professional and technical occupation. 26/ A few countries, Pakistan for example, make a periodic survey of the higher educational institutions to obtain information on faculty, enrollments, entrance requirements, graduations, and related matters.

Although university records are a major source for estimating levels of trained manpower, these sources indicate the "trained as" graduates and not the "employed as" workers. Other factors to consider when analyzing records from universities and training institutions are:

1. The number of graduates who are not able to find work in their chosen field and who are currently unemployed. For example, some developing countries have large numbers of lawyers and liberal arts graduates who are unable to find work in the field for which they were educated and who are not willing to take a job either in another field or at a lower level. These "educated unemployed" may, in some countries, constitute a relatively large proportion of the university output.

2. The number of graduates in one field who take a job in another field. For example, a law school graduate can, with some additional training, become an accountant or administrator.

26/ See, for example, Frederick Harbison and Charles A.Myers, Manpower and Education: Country Studies in Economic Development, McGraw-Hill Book Co. Inc., New York, 1965.

Organisation for Economic Co-operation and Development, Mediterranean Regional Project: various country studies, 1964.

Oferta y Demanda de Recursos Humanos en Centroamerica, Consejo Superior Universitario Centroamerica (CSUCA), 6 volumes, Ciudad Universitaria, Costa Rica, 1966.

3. The number of people who have a professional degree but who work at subprofessional jobs. This situation may occur in some professional occupations for which a surplus of people is being trained and the graduate may be compelled to take a job at a lower level of skill in order to be employed. For example, a man with an engineering degree may work as draftsman. A few developing countries have experiènced this paradox because their economic plans have not kept pace with their manpower development plans.

4. The number of people who received their degrees from universities abroad. Most Ministries of Education maintain records of students who studied abroad. Generally, the list shows the type of course, country of training, and whether the student has returned to his home country. A few AID offices maintain lists of people who receive training grants for study in foreign countries.

5. The number of professional and skilled workers who migrated into or out of the country. (See section on migration statistics, page 21.)

6. The number of women graduates who qualify for professional occupations but who leave the field (or never entered it) to become housewives. These women may eventually return to the profession for which they were trained and should be taken into consideration when planning a survey of skilled manpower resources of a country.

Government Employment Statistics

Many people having professional, technical, and administrative skills and training are employed in Government agencies. In fact, in some countries, Government is the major employer of these people. It is estimated that 60 to 90 percent of the total high-level manpower in the newly emerging African countries are employed by the Government. For example, a 1962 survey of occupations in Ghana revealed that, of the total nonagricultural labor force, nearly 75 percent of the administrative workers and 88 percent of the professional, technical, and related workers were employed in Government agencies. 27/ Where such a situation exists, a survey of Government agencies alone would insure at least a major portion of total high-level manpower in the country. Such data may be available from the central personnel office of the Government. Individual agencies must be contacted for this information in those countries which have no central personnel office.

In addition to supplying employment data of those who work in the Government sector, some individual Government agencies, as a byproduct of their regular functions, may be able to provide data on other high-level and skilled manpower. Records of the Ministry of Education may provide information

---

27/ The Occupational Patterns of Employment in Ghana, 1962, Employment Information Branch, Department of National Employment Service, (Accra, October 1963), tables 3 and 4 on pages 7 and 8, respectively.

on teachers in primary and secondary schools and on professors in universities and colleges. Public health and welfare agencies may supply statistical data on doctors, nurses, and other medical professions. Government offices which administrate the operation of public utilities or other economic activities usually can supply employment data on the people employed in these fields.

Regulatory Agency Statistics

In some countries, certain Government agencies regulate or control public services functions, such as electric power plants, railroads, and telephone and telegraph facilities. Public utilities, in such cases, report periodically on the various aspects of their operations. Included in the reports may be statistical information relating to their employees. For example, in the United States, all telephone companies include in their report to the Federal Communications Commission statistical data on the numbers and occupations of their employees. This is the only source in the United States for obtaining employment information on selected occupations in professional, technical, and skilled groups within the telephone industry.

Licenses and Registration Boards

Many countries maintain registers of professional and skilled people through a licensing or registration system. Records from the licensing authorities can provide accurate information on occupations of persons who have to pass qualifying tests or show a diploma before they can practice their profession or trade. In the United States, registration is done by municipalities, State governments, or private professional associations, but not by the Federal Government. In some countries, (for example, Greece, Thailand and the Philippines), the National Government issues licenses to practice a profession or trade.

Occupations which require licensing or registration are usually connected in some way with public health and safety. Among the professional occupations that may be included in this category are architect, engineer, physician, pharmacist, nurse, teacher; and, among the skilled trades, plumber, electrician, electrical lineman (high-tension), and truck driver.

The information obtained from licensing and registration records can supply important data on the self-employed and others working in small professional and business service offices. However, unless these records are kept up to date, the current status of these individuals, and whether they are still in business or employed, may not be known.

Franchise and Tax Records

In addition to a license to qualify for practicing a profession or trade, some municipalities require the payment of a fee or tax to conduct a nonincorporated business. The people who usually pay such a tax are self-employed professionals, such as lawyers and economists, as well as registered or licensed professionals and skilled workers who operate their own businesses. These data are not necessarily accurate since many people may escape paying franchise taxes if the tax requirement is not enforced. The data may, however, supplement or reinforce information obtained from other sources.

National Rosters

A national roster is customarily limited to scientific, professional, and related technical occupational categories. It lists all individuals who are classified as working, or qualified to work, in their particular profession. The roster may be based upon voluntary or compulsory registration of certain professionals or upon compulsory reports from employing establishments.

Generally, the national roster (or register) is maintained by a Government agency (usually, the Employment Service Office) which is concerned with the supply of high-level manpower. However, other offices may be assigned this responsibility. For example, in Turkey, the Research and Development Office in the Ministry of Defense maintains a roster of scientific and technical personnel. Thailand's National Commission of Education publishes a Who's Who of university graduates based on university records. In Mexico, each graduate in a technical or professional field is registered in the Registro de Titulos Profesionales in the Direccion General de Profesiones. The Development Board of Jordan has recently set up its National Registry of Professional and Technical Manpower. The Economic Planning Board in Korea has published a roster of professional engineers in that country. Some Governments make contracts with professional societies to maintain national rosters. In the United States, for example, the National Science Foundation maintains registers of scientists through the assistance of professional societies which send registration forms to their members.

The major problem with rosters is the high cost and difficulty of keeping them current with the inflows and outflows of each occupation. If it is not compulsory, qualified persons may fail to register in the first place, or later fail to provide the information needed to keep the roster up to date. If registration is compulsory, rosters may provide information showing the number of individuals qualified to perform certain occupations; but, because of difficulties in follow-up, no information on the current status of these people may be available.

Professional Societies and Trade Unions

Membership rosters from professional societies and trade unions are valuable as a source of occupational information and provide an inexpensive way of collecting data on high-level manpower. They have been used successfully in a few countries (for example, Norway, Denmark, and the Netherlands) in which society membership includes substantially all members of an occupation. They are especially useful when trying to count the number of self-employed in a particular occupation.

Membership rosters of professional societies and trade unions are more likely to be current if annual dues are required or if a license is needed to practice the profession or trade. Usually medical and health professional societies provide the most accurate and current information on people in these fields.

Membership statistics should be used with caution since they may be misleading or biased in a number of ways:

1. If only a portion of the members of an occupation or trade are members of the society or union.

2. If the organization covers many occupations in the same generalized field. For example, a union may be organized in the metalworking field and include all occupations ranging from semiskilled machine-tool operators to highly skilled tool and diemakers.

3. If the membership fluctuates with supply and demand.

4. If individuals are members of more than one society or union.

5. If membership records are not kept up to date as to the status and employment of members.

Social, Health, and Unemployment Insurance Plans

Records maintained by social and health insurance plans generally cover broad occupational categories and make no effort to keep information on individual occupations. In a few exceptions, however, certain occupations come under a special system 28/ which may provide some information on occupations of individuals who are covered by these plans. For example, the social insurance systems in Uruguay and Yugoslavia make special provisions for members of liberal professions and for teachers; in Japan and Nicaragua, for teachers; and in Norway, for nurses and a few other occupations.

In some countries, records of unemployment insurance programs may also provide useful information about people in various occupations, such as the employment status, geographic location, and industry in which last employed. Unemployment insurance programs are in operation primarily in the more economically advanced countries, and generally exclude large segments of workers, such as those in agriculture, service, trade, and government. Only a few countries in South America (Uruguay, Ecuador, Chile) and in the Arab States (Algeria and Iraq) have unemployment insurance plans.

28/ Social Security Programs Throughout the World, 1964, Social Security Administration, U.S. Department of Health, Education, and Welfare, Government Printing Office, Washington, 1964.

Armed Forces

Military service in some countries offers various types of training for young men called to serve their country. Because this training is usually for occupations that are related to military functions, some of the skills may not be adaptable to civilian work. However, many of the skills are transferable, either with or without additional training. The impact of military training programs on the civilian economy is demonstrated by the fact that, for example, practically all pilots of domestic airlines and the majority of ground personnel in the Philippines were trained by the Philippine Air Force. Other types of training given by the military and adaptable to civilian service may be for automobile and truck mechanics, metal workers in various machining trades, gunsmiths, communications workers, electrical workers, and clerical workers.

Other Sources

There are many other sources that may be explored to obtain information on the numbers of workers in certain occupations. They are mostly at the local level and include:

1. Telephone directories, especially the classified section which lists telephone subscribers by some major occupations, such as lawyer, phycian, plumber.

2. Local chambers of commerce or boards of trade which may collect employment data for area studies for plant location or for tourism.

3. Industrial directories which are usually maintained by private publishers or by industrial associations.

4. City directories, usually maintained by local governments, which frequently indicate the occupations of people living in the area.

5. Voter registration records, which may possibly list occupations of qualified voters.

6. Police registration records, which sometimes include occupations of those people residing in the jurisdiction.

Chapter 5. Preparing the Manpower Inventory from Secondary Sources

After information from the various secondary sources has been collected, the data must be organized and assembled in an orderly fashion. The process of setting data in order is accomplished by separating the occupational information into the smallest component parts, examining these parts, and then rearranging them into meaningful occupational and, where possible, industrial groups. Thus, the original data are fitted together in logical form to facilitate interpretation and presentation of the final report.

The major steps in the analysis and compilation of manpower information from secondary sources are listed below. The sequence in carrying out the steps is approximately as follows:

Examine Data from Each Source

Each piece of information should be reviewed carefully to determine the content and nature of the information. The data should be examined for:

1. Purpose for which data were obtained.

2. Definitions and concepts used in gathering the data.

3. Time factor--when were the data collected; to what time period do they refer.

4. Coverage--numerical (universe or sample), industrial, occupational, geographic, etc.

5. Method used to collect the data--voluntary or compulsory response, universe or sample, household survey or establishment survey, personal interview or mail questionnaire.

Classify Data

All occupational and industrial data should be classified according to the national systems which are usually based on international recommendations. Although the sources and methods used to collect manpower information may influence the degree of detail, classification of most high-level occupations should be at the finest level of breakdown consistent with accuracy. For example, rather then combining chemist, physicist, geologist, and other physical scientists into one group (1958 ISCO 0-1), 29/ these important occupations should be shown separately. Since their supply/demand requirements are different, the resulting information on separate occupations is more meaningful for purposes of making projections and planning educational facilities and programs.

29/ The new 1966 occupational classification system proposed by ILO separates the various occupations in the scientific and engineering fields.

Tabulate Data

Some tabulations of occupational data are relatively simple; others are more difficult. In some cases, occupational information obtained from one or two sources may be complete as reported and no further work is needed. For example, reports from Ministries of Public Health on numbers of people in various medical professions are usually unduplicated totals representing the entire country. Wherever possible, information on physicians, or other occupations not directly associated with an industry, should indicate where these people work; e.g., public hospitals, private hospitals, research laboratories, or self-employed. If the data are recent, the consultant can be fairly certain that these reported figures are accurate. If the consultant has some doubts about the validity of the data, or if the data are several years old, the figures may be verified or cross-checked by obtaining the number of physicians (for example) who applied for and received licenses to practice their profession. In this case, data from licensing records would have to be totaled for each municipality or province. The tabulation would be in the form of a listing by geographical area to arrive at a total for the country as a whole.

Occupations which are found in many sectors of the economy and for which no license or registration is required may be more difficult to tabulate. For example, chemists may do research and development work in government agencies or in private industry, they may teach in colleges and universities, or they may work on their own account (self-employed) as chemical consultants. To tabulate occupations which cut across industry lines, it is necessary to discover and investigate all possible sources of data.

Each piece of information and the source from which it was derived should be arranged in table form. Internal consistency and accuracy should be checked to avoid overlapping or duplication of data. There is no formula that can be used to determine the amount of overlapping; judgment on the part of the analyst must come into play.

Worksheet 1 illustrates a method for assembling data on scientists and engineers from various sources. The purpose of the worksheet is to report the number of people found in each occupation and to cross-tabulate these by major employer groups, including self-employed. Wherever possible, these major employer groups should be further divided into subgroupings. The following discussion illustrates some problems that may be encountered in making an inventory and indicates possible solutions.

Column 1. In actual practice, census or other benchmark data should be shown for each occupation and cross-tabulated by economic activity. For the sake of simplicity, census totals for each occupation are indicated on worksheet 1. Even though the data may be several years old, they are useful to provide the consultant with some idea of the employment level of the occupations as of a certain date (1960 in this case); they may be used as a control for making estimates of current levels. Assuming concepts and definitions are consistent, census data are presented as reported.

Worksheet 1
Tabulating data from secondary sources

Date: January 1967

Scientific and Engineering Occupations	Control column	Number of employed persons as reported by major employing groups.					Number of employed persons as reported by sources other than major employing groups		
	1960 Census	Total of columns (3)-(6)	Govern-ment agencies	Colleges and univer-sities	Private industry 1/	Self-employed 2/	Franchise and tax records	Licenses and regis-trations	Professional associations
TOTAL	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Engineers*	800		500	200	-	100	75	100	400
Chemists	300		100	100	-	30	30	3/	200
Physicists	100		50	20	-	10	10	3/	50
Agronomists	60		30	20	-	5	5	3/	20
All others	100		70	20	-	10	10	5	50
	1360		750	360	-	155			

1/ No consolidated information on industry employment available. See text.

2/ No consolidated information on self-employed available. See text and columns 7,8, and 9.

3/ Not applicable.

*In actual practice, engineering occupations should be subdivided into areas of specialty, civil engineering, etc.

Column 2. This is left blank until the remaining columns in the major-employer group are completed to the satisfaction of the analyst.

Column 3. Information on employment by occupation in Government agencies is generally available from records maintained by the Central Personnel Office (or Civil Service Commission equivalent). In those countries which have no Central Personnel Office, a complete survey or census should be taken of each Government agency. Employment data should be shown by agency and, if available, by function (research, teaching, etc.).

Column 4. Data on the number of professional employees working in educational institutions as teachers, researchers, and similar activities usually come from reports submitted by colleges and universities to the Ministry of Education. Only full-time employees in colleges and universities should be included in the tabulation to avoid double-counting. It is a common practice of many professional workers to supplement their incomes from their primary places of work by teaching evening classes at the local college or university. Since it may be assumed that they work full time in some other economic sector (Government or private industry), they will be accounted for in those areas.

Column 5. Information on occupational breakdowns in private industry is seldom available in the detail necessary for an inventory. Government regulatory agencies may have some occupational information in the industries which they regulate; but, for most other industries, this information will have to be obtained from other sources.

For example, professional associations may be able to supply data on the industrial attachment of their members; however, not all professional workers belong to these associations. Information on occupations, cross-tabulated by industry, from a census of industry is not in fine enough detail to be of value in making the occupational inventory. Data from labor force sample surveys show only broad occupational groups, rather than detailed occupations. Special-purpose employer surveys, if they are recent, may be the only source of information for employment in specific high-level occupations. Unfortunately, however, data may be lacking in some surveys either because not all high-level occupations were included, or because the numbers of workers in each occupation were not recorded. The only way of completing this column with any degree of accuracy is to conduct a survey of establishments. Conducting such a survey is discussed in the next chapter.

Column 6. Most professional and technical personnel in the self-employed category are consultants who work in their homes or rent small offices and hire a few employees. Because of their size, small-scale consulting firms are usually excluded from an establishment survey. Therefore, to obtain the numbers of this small but important group of professional workers, other sources must be investigated. Telephone and business directories may supply names and addresses of persons listed under specific professions. Business tax records or license records maintained by the Government may also give listings of people by professional category. The following discussion describes some of the limitations in using these and other secondary sources.

Columns 7, 8, and 9. These columns are examples of the type of information that may be available to the manpower consultant. The decision to use these data is based on the judgment, observations, and impressions of the consultant and his knowledge of the particular situation in the country.

Column 7. Shows the number of people who paid a fee or tax to operate a nonincorporated business. All these people may be counted as self-employed. However, not all the self-employed are necessarily included in this source since some may not pay a franchise fee. By definition, hired professionals would not be included in this group.

Column 8. Lists the number of scientists, engineers, and other professionals who obtained licenses from or registered with the appropriate regulatory agency to practice their profession. Unless there is information to the contrary from the appropriate authorities, the analyst may assume that scientists and engineers who are employed in Government, private industry, and educational institutions do not need a license to practice. Therefore, scientists and engineers who are licensed or registered may be considered self-employed.

In the example in worksheet 1, it is assumed that only engineers and a few occupations in the "all other" group require licenses to practice. In such a situation, the figure for the "license" group is usually higher than that for the "franchise fee" group, since professionals hired by small unincorporated consulting firms usually are licensed, but do not have to pay the franchise fee.

Column 9. Shows the number of professionals who are members of the various professional scientific and engineering associations. It is in this area where duplication would occur since members may be employed by Government, universities, and industry and are therefore accounted for in other columns. Furthermore, members may belong to more than one association. For example, chemical engineers may belong to both the chemical society and the engineering society. Membership records may also provide an incomplete count since many professionals do not belong to any association. If records are not kept up to date or if dues are not required, names of those who died or retired may still remain on the rolls. Unless it can be determined that all or most of these professionals are members of societies and that the records are current, data from professional society records should be used with caution in order that the inventory may be unduplicated.

In summary, the manpower consultant must fill in column 6 with the best information that is available to him. While there are many possible sources, only a few more obvious ones are described here. In this particular case, the consultant should select the higher of the two figures in columns 7 and 8 on the assumption that these data are recent enough to provide a fairly accurate count of the self-employed. The consultant should not be unduly concerned if a few self-employed are overlooked since the final figures will be rounded. Columns 3 and 4 may be obtained directly from employment records of Government agencies and universities; column 6 may be derived from other secondary sources. There remains only column 5 to complete. For developing countries with little or no industry, the information already obtained may represent the total employment in these occupations. In this case, there is no further investigation necessary. If, on the other hand, the industrial sector of the economy is a small but growing force, the manpower consultant should make every effort to conduct a survey of employing establishments to fill in the gap left by the omission of column 5. The following chapter describes the steps involved in conducting a survey of establishments.

Chapter 6. Conducting a Survey of Establishments

A previous manual prepared for AID described the techniques of setting up a continuous reporting system to collect certain specific information from establishments. 30/ This chapter describes the techniques for making a one-time survey of establishments to obtain the number of high-level and skilled manpower employed in those establishments.

The information required to prepare this chapter was obtained from an analysis of the experiences and recommendations of manpower consultants who conducted establishment surveys in the countries to which they were assigned. Many of the technical details discussed in this chapter are similar to those used by the U.S. Department of Labor's Bureau of Labor Statistics in conducting special surveys of employment by occupation. If additional information is needed, the BLS will provide specific technical assistance on any of the topics discussed in this chapter.

Obtain Cooperation Among All Sectors of the Economy

One of the first steps in conducting a survey should be to establish a manpower advisory committee of representatives of government, private employers, and labor. This committee would be responsible for determining policy in the manpower field, providing advice and encouraging participation of its representative groups. Active participation of such a committee can help facilitate the conduct of the survey and insure utilization of the resulting data. All aspects of the survey should be understood and supported by members of this committee who, in turn, can influence members of their respective organizations to cooperate and offer suggestions. Such a committee provides a mechanism for continuing the effort in manpower research and planning on completion of this specific project.

Plan Publicity Campaign

Since the survey of high-level manpower will involve personal contacts with employers, it is important that these people be aware of the existence of the survey before interviewers call on them. Publicity efforts can be made through the cooperation and coordination of the manpower advisory committee. Newspapers, radio and television, trade journals, and government publications are the major outlets for a strong publicity campaign which should be maintained for the duration of the survey. These media are usually more cooperative in distributing the results of the survey if they have had active prior participation.

Contact Representative Groups in the Economic Sector

Working through the manpower advisory committee, the survey staff should try to meet key personnel in universities, industrial establishments, and Government agencies. Much information can be obtained from members of

---

30/ How to Establish Current Reporting of Employment, Hours, and Earnings in Developing Countries. op. cit.

these groups--information that comes from their observation and experience. The discussion can also provide a better understanding or "feel" for the manpower problems in the country. These people are in a position to provide help or suggest solutions to what, at first, seem to be insurmountable problems. For example, in a few manpower surveys, universities supplied third- and fourth-year students to serve as interviewers, with obvious advantages in the conduct of the survey as well as to the students.

Recruit and Train the Interviewers

It has been found that young, energetic, and, of course, literate people make the best interviewers. Some interviewers may be recruited from Peace Corps members (as in Bolivia), from among third- and fourth-year university students (as in Ethiopia and Puerto Rico), or from unemployed university dropouts (as in Colombia).

The amount of time spent in training varies from a few days to a few weeks. One indication of the length of training time is the experience in the Colombian Survey (1963). 31/ There, a 5-day training seminar was established to prepare 35 full-time interviewers for a 3-month period of interviewing. Training should consist of explanations and definitions of all terms and concepts used in the survey. A full explanation should be provided on the purposes of the survey and the ultimate use of the information so that the interviewers can discuss these topics intelligently with the persons they contact.

Develop a Timetable

A timetable or work schedule should be prepared in order to utilize time and personnel in the most efficient manner. Each phase of the survey can then be analyzed for the time period and manpower required to perform the particular task. Estimates should be made of the starting and completion dates of each operation. The timetable may consist of such major topics as planning survey, recruiting and training interviewers, conducting interviews, tabulating data, analyzing results, and preparing report. Each of these major categories can then be further broken down into several subgroups depending on the particular requirements for conducting the survey.

Generally, there is a tendency to underestimate the amount of time required to conduct an interview. The interviewer must explain to the establishment official the purpose of the survey and try to get his cooperation. Then he must try to obtain the information from records (and often from the memory of the owner) that are frequently not organized in the usually accepted method. The problems of distance between establishments and the method of transportation must also be considered when making a time schedule. In the 1961 Liberian survey, 32/ it was estimated that an average of one questionnaire per man-day could be completed, since a high number of recontacts

---

31/ William A. Langbehn, Status of ICETEX Survey of High-Level Human Resources, July 15, 1963.

32/ William A. Langbehn, A Pilot Survey of High-Level Manpower in Liberia, September 1961.

was anticipated. If distances between establishments are short and the length of the questionnaire is held to a minimum, it may be possible to complete 3 or 4 questionnaires per man-day.

Determine Specific Data to Collect

Establishment surveys afford the opportunity to collect a wide range of information about wage and salaried employees relating to their employment, hours of work, earnings, labor turnover, education and training, skill levels, occupational wage rates, age, sex, country of origin. Other information obtainable from an establishment survey includes the type of occupational training offered by the establishment, the number of current job vacancies, and the anticipated demand for certain workers. Some of these data are factual; others are based on the employers' opinion or interpretation of the employment situation.

Although all these items may supply interesting information on the economic and social characteristics of employees, it is not necessary or feasible to collect this wealth of detail. For the purpose of estimating numbers of employed high-level and skilled manpower, only a few of these items are necessary. The absolute minimum of data normally required in such a survey is as follows: 33/

1. Basic identifying data.
   a. Name of establishment.
   b. Location and how to reach the office or plant.
   c. Products made or services rendered.
   d. Name of official supplying information.
2. Basic occupational data.
   a. Total employment as of a specific period.
   b. Employment by selected occupation.

In addition to the basic occupational data, other information relating to high-level occupations may also be collected. Information such as the level of education, age, sex, and country of origin of each employee in the surveyed establishments can aid in planning future manpower supply and demand. For example, since one of the goals in economic development is to replace foreign workers with indigenous workers, information on the country of origin of high-level workers is valuable for projecting manpower requirements and planning educational and training programs.

Another type of information that may be collected in a manpower survey is the earnings or wage rates of each surveyed occupation. Such data may be extremely valuable in comparing levels of similar occupations among various

---

33/ The U.S. Department of Labor's Bureau of Labor Statistics plans to conduct annual surveys of establishments to collect occupational employment in each major industry. The information requested will be limited to the basic data described here.

establishments. For example, some doubt may arise about the comparability of occupations based on titles alone. Lacking detailed occupational descriptions, weekly or monthly earnings (or wage rates for hourly-paid workers) may provide a clue as to the real "worth" of employees in high-level occupations since supply and demand tend to force earnings to about the same level for similar occupations. This concept is not applicable in all situations, however, since, in many developing countries, there may be either a strong worker-loyalty attachment to a certain firm or a traditional lack of worker mobility among firms.

Define Scope of Investigation

The area of investigation may be limited by the resources available to conduct the survey. More reliable and useful information can be obtained from establishments if the survey is concentrated in those areas--both geographic and industrial--in which the greatest numbers of high-level personnel are employed.

Geographic Coverage. Most manpower surveys are limited to those geographic areas in which Government offices, universities, and major industries are located. Generally, people with skills and/or education tend to gravitate toward centers of employment opportunities. In a small country, the capital city may be the center for all these activities. For example, in Thailand, surveys of establishments to obtain occupational information were limited to the Bangkok-Thonburi area. 34/ In other countries, geographical coverage may be expanded to include mining areas, plantations in outlying areas, and industrial centers.

Economic Activity Coverage. The manpower survey should include only those economic activities which are likely to employ high-level and skilled workers. In most economies, especially those which are still in the early development stage, the greatest numbers of high-level and skilled manpower are located in Government and in schools and universities. The manpower consultant should review the remaining economic activities (see appendix B for listing) and, on the advice and guidance of the high-level committee, recommend which of these activities should be included in an establishment survey. The following discussion may provide some basis for making selections.

Division 0. Agriculture. This segment of the economy should be included if there are large plantations which employ agronomists, foresters, or other high-level agricultural specialists. In most developing countries, people trained in these technical agricultural fields are, for the most part, employed by the Government.

34/ Reported by Edgar C. McVoy in DOLITAC Staff Paper, No. 5, January 6, 1965.

Division 1. Mining and Quarrying. If a substantial proportion of the nonagricultural labor force is employed in this sector, mining and quarrying should be included in the survey since many of these operations require professional and skilled personnel. Oil well drilling and production should also be included if this is a major industry.

Divisions 2 and 3. Manufacturing. Although manufacturing establishments may make up a relatively small proportion of the total employment, it is advisable to include this segment in a manpower survey. Except for Government and educational institutions, manufacturing is usually the major source of employment for high-level manpower.

Division 4. Construction. This economic activity employs many engineers and other technical people as well as skilled workers requiring special training or education. However, it is usually difficult to obtain adequate coverage of the construction industry because of the high rate of industry turnover (firms may operate for one building project and then disband), and of the highly seasonal nature of the industry. Despite these deficiencies, every effort should be made to include this segment of the economy in a manpower survey.

Division 5. Electricity, Gas, Water, and Sanitary Services. Establishments which supply these services employ many high-level technical and skilled personnel. Frequently, this sector of the economy is Government or quasi-Government operated, or it may be regulated by a Government agency. If detailed employment data are not available from the Government operating or regulatory agency, this sector should be included in a manpower survey.

Division 6. Commerce. Wholesale and retail trade is usually made up of a great number of small establishments with many part-time and unpaid family workers whose skill levels are at the low end of the scale. For the purpose of collecting information on high-level manpower, it would be wasteful to include these sectors. The remaining commercial establishments, such as banks and insurance companies, should be included in the survey since they employ many professional workers.

Division 7. Transport, Storage, and Communication. Transportation (railroads, airlines) and communication (telephone, telegraph) should be included in a survey because of the large numbers of people with specialized skills employed in these activities. Storage and warehousing can be omitted since few, if any, high-level people are employed here.

Division 8. Services. Of the various services, Government, community (medical, education, legal) and business services are the most important employers of high-level manpower. Business service firms may also be included to account for high-level personnel such as architects, accountants, and engineers. The remaining services do not employ enough high-level manpower to warrant the expense of a survey.

Determine the Benchmark

A survey of all the establishments which make up an industry is really a census of that industry. The information obtained on employment represents a total count of the number of workers at the time the census survey was taken. This total count (or universe) becomes the "benchmark" or base from which later employment data may be measured. Subsequent data may be obtained from a sample survey of establishments. If a benchmark from a previous census is available, the sample data can be "blown up" to represent the total by making certain adjustments. [35]

Developing a benchmark for an industry or for an occupation requires investigation of the various sources of data. Censuses of manufacturing, mining,etc.,may supply total counts of employment in each economic activity. In some countries, totals of broad occupational groups and some individual occupations may also be available from these censuses.

Benchmark estimates of the occupational composition of an industry should be constantly checked for internal consistency by comparing the totals with what is known, from other sources, about total employment in the industry or in the economy as a whole. By compiling data from various censuses and by checking one against the other, in conjunction with information from other sources, it may be possible to arrive at a reasonably accurate benchmark for each industry.

Depending on the results of the benchmark research, the manpower consultant may find that there is a reliable benchmark for some industries or occupations, and not for others. In such cases, the consultant should prepare a sample in those areas for which benchmark data exist and a census in the nonbenchmark areas. It is not advisable to conduct sample surveys without a benchmark since (1) there is no way of estimating the portion of the sample taken and (2) there is no way of "blowing up" the sample to represent the universe.

Because of the difficulties and expense of taking a census of all establishments, the manpower consultant may have to compromise by covering the major establishments in an industry and sampling the smaller firms. Although the results would not yield a reliable total for the industry, they would give the manpower consultant a fairly good impression or picture of the occupational distribution.

---

[35] The method of making these adjustments will be described in the section on estimating procedures. The point here is that a benchmark is a necessary requirement for making the adjustments.

Develop a List of Establishments

One of the major problems in starting a survey is getting a list of establishments in those economic activities which are to be included in the survey. Chapter 4 describes the major sources of manpower information; many of these sources can also supply lists of establishments. If an industrial census has been conducted recently, 36/ a list of establishments, with total employment in each, may be available from the agency in charge of the census. Local employment service offices may be able to supply names and addresses of establishments within their local area and, often, the number of workers in each establishment. Social insurance agencies in developing countries are usually able to supply a list of establishments by employment size and by industry. For example, these agencies in the Central American countries have recently prepared such a listing of all establishments employing 5 persons or more. Regulatory agencies and tax offices may also be able to supply at least a partial listing of establishments.

Producers' or manufacturers' associations maintain lists of plantations and manufacturers who are members of their organizations. These sources may supply a complete coverage for a particular industry group. For example, all firms involved in growing and processing coffee, in many Latin American countries, are members of local coffee producers' associations.

It is not always possible to compile a list from a single source, but rather from a combination of sources. To cite an example, the manpower consultant to the 1961 Liberian survey 37/ developed his list of establishments from previous lists developed by ILO, Northwestern University, and the Liberian Bureau of Economic Research and Statistics; supplemented by the Liberian Department of Agriculture and Commerce list of registered firms; and the U.S. Department of Commerce list of American business firms in Liberia. When such a combination is used, it must be carefully checked in order to avoid duplication of establishments; large establishments, particularly, may appear on several lists.

Select a Sample of Establishments

In selecting a sample for a survey of establishments, it is preferable that an experienced statistician be available to provide guidance and advice. In the course of developing a sample, many technical problems arise that can be resolved by a qualified statistician. The type of sample that is eventually used is based on several factors, most important of which is the availability of resources. Some of the other determinants include the reliability of the mail service, and the general attitude of managers toward responding to surveys. These and other nonstatistical considerations must be evaluated before developing a sample.

36/ Many countries participated in the 1963 World Program of Industrial Censuses recommended by ILO.

37/ A Pilot Survey of High-Level Manpower in Liberia, op. cit.

The objective of a sample 38/ is to approximate through a partial count the results that would be obtained through a complete count. Through the use of a sample, the required information becomes available more quickly and at less cost. The advantage in collecting information from establishments, rather than from individuals as in a household survey, is that accurate data on a large number of employees can be obtained from a single source--the establishment. Moreover, this information can be obtained more quickly and cheaply than if each worker in these establishments were interviewed. The major tasks facing the manpower consultant at this stage of preparing a survey are determining the size of the sample and selecting the specific units (establishments, in this case) to include in the sample.

Manpower consultants assigned to developing countries have tried many sampling techniques to obtain estimates of high-level and skilled manpower. In most cases, good results were obtained by selecting a sample consisting of all establishments employing over a specified number of workers. Such a sample provides the greatest employment coverage for the least cost. For example, in some countries, a survey of all establishments employing more than 50 or 100 workers may provide a sample of 10 percent of the firms covering 75 percent of the employment. Moreover, there is a tendency for high-level manpower to be concentrated in large firms.

A few manpower consultants extended their selection of large firms to include a sampling of firms employing fewer numbers of workers. The inclusion of small firms provides a sample with a balanced representation of all size classes while continuing to give more weight to the larger establishments in the universe. Moreover, expanding the size of the sample provides more information on the occupational composition of small-sized firms which frequently do not employ proportionately many high-level personnel. In those cases where small firms were included in the surveys, the manpower consultants appeared to be more satisfied with the final results. However, it should be pointed out that the additional information may be less than proportional to the added effort and cost.

Cutoff Method. The following discussion may provide some guidelines for selecting the number of establishments to include in each industry in a survey. The particular method described combines the principle of the cutoff point (a census of establishments over a certain employment size) and the principle of a statistical sample (a random selection of the remaining establishments).

Worksheet 2 shows an example of the method of selecting a cutoff point in one industry. The steps are as follows:

1. List all establishments in each economic activity in descending order by number of employees. (Columns 1 and 2)

38/ For a full discussion of sampling, see Morris H. Hansen, William N. Hurwitz, and William G. Madow, Sample Survey Methods and Theory, Volume I, Methods and Application (New York, John Wiley & Sons, Inc., 1953); and William G. Cochran, Sampling Techniques, (New York, John Wiley & Sons, Inc., 1963).

Worksheet 2
Selecting a sample from list of establishments in one industry

Industry: Textile Mfg

Area: Capital City

Date: January 1967

Establishment	Employment	Cumulative total	Cutoff system of sampling	Quarter system of sampling
A	198	198	Sample of 100 employees or more includes 32 percent of employment in industry	First and second quarters--include 50 percent of employment in industry
B	150	348		
C	133	481		
D	97	578		
E	95	673		
F	90	763		
G	87	850	Sample of 50 employees or more--includes 69 percent of employment in industry	Third quarter--includes next 25 percent
H	75	925		
I	67	992		
J	58	1,050		
K	49	1,099		
L	45	1,144		
M	43	1,187		Fourth quarter--includes last 25 percent
N	42	1,229		
O	41	1,270		
P	40	1,310		
Q	40	1,350		
R	39	1,389		
etc.	-	-		
n	5	1,520 - Total employment		

2. Secure a cumulative employment total. (Column 3)

3. Select a cutoff point. (Column 4)

In this example, three firms employ 100 workers or more, making up 32 percent of the industry's employment. While this employment coverage may be satisfactory for a survey, there is always the risk that 1 of the 3 firms may refuse to be part of the sample, thus further reducing the size of the employment coverage. In this particular situation, the cutoff point should be set at a lower limit, perhaps to 50. A survey of establishments A to J, each employing 50 workers or more, would yield an employment coverage of 69 percent. If one firm drops out, the lower employment coverage would not seriously affect the validity of the results; it would be assumed that the proportion of high-level and skilled occupations in the drop-out establishment is similar to that in the remaining establishments in the industry.

If it is felt that adequate coverage of the industry can be obtained from surveying only the large establishments, then the procedure for selecting a sample can stop here. For example, some industries are made up primarily of a few large establishments, such as refineries in the petroleum industry. If, on the other hand assuming available resources, the analyst feels that a sampling of firms below the cutoff point can yield enough valuable information to justify the additional costs, then the sample selection would proceed.

Of prime importance is the number or percent of establishments to include in the sample below the cutoff point. If the industry is made up of a large number of small firms, a 5- or 10-percent sample (a ratio of 1 in 20 or 1 in 10, respectively) may be sufficient to represent these firms. Some manpower consultants used a 25-percent sample (1-in-4 ratio) when there was a relatively small number of establishments. Of course, as the sample size increases, the validity of the results improves, but the costs also are greater.

The manner of selecting establishments, once a ratio has been determined, is usually by random selection. Theoretically, each establishment in the employment-size class below the cutoff point has an equal chance of being selected for the sample. If a 10-percent sample (1-in-10 ratio) were selected for the less-than-50 size class, every tenth firm would become a part of the sample. In order to select every tenth firm, however, a starting number is needed. This is obtained by choosing a number less than 10 at random, 4 for example. By going down the list of establishments under the cutoff point, the fourth establishment on the list is selected, then every tenth firm: 14, 24, 34, etc. Each of these firms becomes a part of the sample. If one firm should refuse to cooperate, then the firm immediately above or below (firm 13 or 15, for example) should be substituted.

The important thing to remember is that the sample selection should be spread over the entire range so that the results better represent the occupations in the particular size class. As was indicated earlier, the firms at the upper end of the employment scale are likely to have a proportionately greater number of technical and skilled workers. If too many of these firms are included in the sample, they will have a disproportionate weight in the "blown up" figure, thus not truly representing the employment levels.

Quarter System. Another way of selecting a sample of establishments is to divide employment in the industry into quarters. This method has been used in conducting manpower surveys in some developing countries and is recommended by the Bureau of Employment Security. [39] Using information from Worksheet 2, the steps are as follows:

1. Arrange all establishments in each economic activity in descending order by number of employees. (Columns 1 and 2)

2. Secure a cumulative employment total. (Column 3)

3. Determine midpoint from grand total. The larger establishments which represent the upper 50 percent of employment make up the first and second quarters. In worksheet 2, establishments A to F make up the first two quarters. (Column 5)

4. Determine midpoint in the lower 50 percent of employment as the point between the third and fourth quarters. In worksheet 2, establishments G to L make up the third quarter and the remaining establishments comprise the fourth quarter.

5. Using the divisions just obtained, select the establishments for inclusion in the sample in the following manner:

   a. All establishments in the upper 50-percent employment level (the first two quarters) in each economic activity should be in the sample.

   b. A 50-percent sample ($\frac{1}{2}$) of the establishments in the third quarter should be in the sample. [40] (Select every 2nd establishment for inclusion in the sample.)

   c. A 25-percent sample ($\frac{1}{4}$) of the establishments in the fourth quarter should be in the sample. (Starting with a random number less than 4, select every 4th establishment for inclusion in the sample.)

---

[39] Area Skill Survey, Handbook on Employment Security Job Market Research Methods, BES No. E-252, November 1965, Bureau of Employment Security, U.S. Department of Labor, p. 23 ff.

[40] Generally, sampling ratios tend to be lower than those suggested here. A ratio of 1 in 5 (20 percent) for the third quarter and 1 in 25 (4 percent) for the fourth quarter is not uncommon, especially when an industry is characterized by a large number of small firms and a relatively few large firms.

Other Country Experiences. Perhaps a few examples of the cutoff points selected for manpower surveys in other countries may illustrate the need to depend on the local situation and condition to determine the size of the cutoff. (See also appendix A.)

British Guiana, 1962. Interviews with establishments employing 100 or more, plus Government agencies and training institutions, yielded an estimated 95-percent coverage of high-level manpower.

Colombia, 1963. All economic sectors excluding agriculture were surveyed. Firms with 50 employees or more and all segments of government employment including National, departmental, municipal, and independent agencies made up the establishment coverage.

Ethiopia, 1964. All firms employing 50 workers or more were interviewed. A sample of establishments employing fewer than 50 employees only confirmed the belief that, except for professional firms, "virtually no high-level manpower is found in these smaller organizations." It was estimated that 90 percent of the high-level manpower in Ethiopia worked in the large establishments, including Government. In all, 125 establishments were surveyed, employing 60.6 percent of the total in nonagricultural industries. Government accounted for 67 percent of all employees engaged in high-level occupations. Commerce and trade, traditionally composed of many small establishments, did not employ many high-level people.

Kenya, 1965. The survey included 348 private and parastatal enterprises plus Government agencies. All employers with 100 workers or more were included. In specific industrial groups where this provided an inadequate sample (less than 40 percent of employment), additional establishments with less than 100 workers were added. Total employment in the establishments in the survey made up 77 percent of all nonagricultural workers. The percent of the nation's high-level manpower that was included in the survey was much higher because of the heavy concentration of these skills in Government and in the larger employing establishments. Some attempt was made to secure data from large agricultural employers. However, this was not successful because only 14 out of the 40 surveyed returned completed forms.

Korea, 1961 and 1963. The first technical manpower survey (1961) covered nearly 1800 establishments employing 50 persons or more, all Government offices, and science and engineering schools, and a sampling of establishments employing fewer than 50 persons. The second technical manpower survey (1963) was smaller in design than the first survey and included agriculture and the armed forces. Some definitions were changed and some occupational categories were eliminated so that the results are not comparable with the 1961 survey. All establishments with 50 people or more were surveyed, while a sample of those employing 5 to 49 people was chosen.

Portugal, 1961. A sample survey of establishments in the secondary and tertiary sectors was made in 1961. Establishments in each economic sector were stratified by size of employment and a sampling ratio was selected for each stratum, as follows:

Employment size	Mining	Manufacturing	Building	Electricity
100 and over	1	1	1	1
21-100	1	1/10	1/2	1
11-20	1/4	1/20	1/10	1
6-10	1/6	1/40	1/20	1
2-5	1/15	1/100	1/25	1

Tanzania (formerly Tanganyika), 1962 and 1964. In a survey made in 1962, 115 establishments employing 50 workers or more were selected. Employment in these establishments constituted over 70 percent of all nonagricultural workers. The smallest industry coverage (20 percent) was in Commerce; but, with this group heavily characterized by unpaid family workers, relatively few high-level occupations were found. In the 1964 survey, the coverage was substantially the same as in the 1962 survey. It included 108 private and parastatal enterprises plus all Government agencies. No employer with fewer than 50 workers was included.

Uganda, 1959. Personal visits were made to 102 employers, including Government, accounting for 82 percent of the nonagricultural workers. All firms employing 100 or more were included in the survey; Government was 100-percent covered. Retail and wholesale trade was omitted from the survey since it is characterized by a large number of small firms, mostly family owned and staffed.

Prepare Employment Estimates

The preparation of employment estimates is discussed out of sequence at this point because it is believed that the reader will better understand the previous sections if the closely related techniques of constructing a benchmark, selecting a sample, and preparing estimates are discussed as a unit. In actuality, the preparation of employment estimates will occur after the schedules are tabulated.

That portion of the survey which included all establishments employing over a certain number of people in itself provides a census or total count for that size class in the industry. No further work would be necessary to "blow up" the data--that is, if all establishments reported. If some of the large establishments failed to report, however, then an estimate of the number and types of occupations the missing establishments employ would have to be made. Assuming that all establishments of approximately the same size, and making the same type of product, have a similar occupational distribution, an estimate of the total occupational employment in a specified size

Worksheet 3

Preparing estimates of employment from cutoff sample system

Industry: Textile Mfg

Area: Capitol City

Date: January 1967

Selected occupations	Establishments with 50 workers or more		Establishments with fewer than 50 workers		Estimated total employment in industry (Col.2 plus Col.4)
	Employment in reporting establishments (excluding C & F)	Estimated employment (including C & F)	Employment in reporting establishments 25% sample	Estimated employment	
	(1)	(2)	(3)	(4)	(5)
Total	827	1,050	125	470	1,520
Engineers, mechanical	19	24	3	11	35
Technicians	26	33	4	15	48
Administrators & managers	22	28	4	15	43
Secretaries	18	23	2	8	31
Typists	25	32	4	15	47
Loom fixers	16	20	3	11	31
Electricians	14	18	2	8	26

Note: Information on this worksheet comes from worksheet 2. For purposes of illustration, it is assumed that all establishments employing 50 or more workers (establishments A to J) were included in the survey and that establishments C and F failed to report.

class may be obtained by "blowing up" the known or reported data to take into account the unreported data.

Using information from worksheet 2, it is assumed, for purposes of illustration, that all establishments employing 50 workers or more (establishments A to J) were included in the survey and that establishments C and F failed to report. The following steps, in conjunction with worksheet 3, describe the procedure for making employment estimates when some establishments do not report.

For establishments with 50 workers or more:

1. Total each selected occupation for which information was obtained from reporting establishments and place totals in column 1 on worksheet 3.

2. Divide total estimated employment in all establishments (A to J) by total employment in the reporting establishments (A to J, excluding C and F) to obtain a ratio. (1050 ÷ 827 = 1.27)

3. Multiply this ratio by each of the reported occupational figures (column 1) to get estimates of total occupational employment for all the establishments in this size class. (1.27 X 19 = 24.16) Round the figures and place results in column 2.

The same principle may be used for estimating occupational employment in the smaller size class groups from which a sample was taken; that is, the benchmark total is divided by the sample total to obtain an inflation ratio. In worksheet 3, the ratio for the size class with fewer than 50 workers is 470 ÷ 125 = 3.8. This ratio is then multiplied by each figure in column 3 to arrive at the "blown up" figures in column 4. (3.8 X 3 = 11.4 rounded to 11)

This estimating procedure may be applied to all size classes in the industry. When occupational estimates for all size classes are computed, they are added to arrive at totals for each selected occupation in the industry. In worksheet 3, columns 2 and 4 are added to get estimated total employment by selected occupation in the textile industry for a specified area, as shown in column 5.

When the quarter system of sample selection is used, the method of estimating employment is different from that just described. Basically, sample data obtained in the quarter system are inflated by applying the reciprocal of the selected ratio. Worksheet 4 illustrates this method of inflation. Since the first and second quarters represent full coverage (or a 100-percent sample), no inflation is needed. If a few establishments fail to report, however, the "blowup" method described in steps 1, 2, and 3, above, should be used. If the third quarter represents a 50-percent sample, ($\frac{1}{2}$), information received from these sample establishments should be inflated by the receiprocal of $\frac{1}{2}$, or 2, which becomes the inflation factor. The result is the estimate of employment in each occupation in the third quarter.

Worksheet 4
Preparing estimates of employment
from quarter sample system

Industry: Textile Mfg
Area: Capital City
Date: January 1967

Selected Occupations	First and second quarters 100% coverage All establishments reported	Third quarter 50% coverage		Fourth Quarter 25% coverage		Estimated total employment in industry Total of Col. 1, 3, and 5
		Sample	Raised by inflation factor= 2	Sample	Raised by inflation factor= 4	
	(1)	(2)	(3)	(4)	(5)	(6)
Engineers, mechanical	19	6	12	1	4	35
Technicians	28	6	12	2	8	48
Administrators & managers	24	5	10	2	8	42
Secretaries	17	5	10	1	4	31
Typists	27	6	12	2	8	47
Loom fixers	18	5	10	1	4	32
Electricians	14	4	8	1	4	26

If the fourth quarter represents a 25-percent sample, $(\frac{1}{4})$, the reciprocal is 4 and each item is raised by that factor to obtain an estimate.

The consultant should not attribute material significance to the exact numerical value of any estimate since the basic data are derived from a sample. Exact figures may be used for internal computations and for arriving at grand totals. However, in the final totals that are prepared for publication, only rounded figures should be presented.

Prepare Questionnaires

The design of the schedule and the type of information requested are dependent, to a large extent, on the method of collection used. In a mail survey, the questionnaire should be as brief and clear as possible, asking the minimum number of questions required to accomplish the purpose of the survey. Although the temptation is great to include additional items that would be of interest in understanding the manpower situation in a country, a lengthy questionnaire requiring too much work on the part of the respondent may cause him to lose interest or refuse to cooperate. Surveys that are conducted by personal interview can usually incorporate additional questions about the employees, such as age, sex, etc.

Appendix F illustrates two types of questionnaires: the first (F-1) is a sample of a personal interview questionnaire which shows some of the types of information that may be requested; and the second (F-2) is a sample of a mailed questionnaire [41] which requests only numbers of people in selected occupations.

The questionnaire, or schedule, is usually made up of three basic parts: identifying information, questions, and instructions for completing the questionnaire, as follows:

Identifying Information. The name and address of the establishment, its branches if any, the major products or services, the name and title of the firm representative who supplies the information, and a blank box for the use of the statistical office.

The Questions. A listing of the occupations which are selected for inclusion in the survey, arranged in orderly fashion. In addition to requesting the number of people employed in each occupation, other information relating to the characteristics of the workers may be included. Age, sex, country of origin, educational levels, wage and salary levels, apprentices or trainees, current job vacancies, and anticipated future requirements are the more usual types of additional information requested. In practice, additional items should be limited to only those essential for the purposes of the survey.

---

[41] The questionnaire in appendix F-2 is a reproduction of one used in the U.S. Department of Labor's Bureau of Labor Statistics pilot survey of employment in selected occupations in the computing and accounting machines industry in 1966.

Instructions. Pertinent information for completing the questionnaire. Instructions are an important part of the questionnaire when the survey is conducted by mail. (See example in appendix F-2.) They should be carefully prepared so that the respondent can complete the questionnaire without further assistance. In a survey conducted by personal interview, detailed instructions are not always necessary but may be helpful as a reminder to the interviewer during his visit to the establishment. The interviewer has his technical manual and previous training to supply him with the details needed to collect information.

Frequently, definitions of the occupations included in the survey are also attached to the questionnaire. They are essential in a mailed questionnaire to provide assistance and guidance to the person completing the schedule. (See appendix F-2.) Accompanying definitions are helpful but not essential when the information is collected by a trained interviewer.

In addition to the preparation of the questionnaires, letters to all establishments in the survey should also be written. Generally, when the survey is conducted by personal interview, a letter is sent a week or two in advance of the interviewer's visit. (See sample letter in appendix F-1.) The letter should describe the purpose and importance of the survey, request the respondent's cooperation, and indicate the approximate time the interviewer will call. When the survey is conducted by mail, the letter, usually containing more details, accompanies the questionnaire. (See sample letter in appendix F-2.)

Test the Questionnaires

After the questionnaire has been prepared, personnel from key establishments (who may also be members of the manpower advisory committee) should have the opportunity to review the questionnaire. When their comments have been incorporated (if appropriate), the questionnaire may be tested by means of a pilot survey.

A pilot survey consists of selecting a few establishments at random and asking them to complete the questionnaire. The number of establishments to include in the testing varies according to local conditions. Interviews with a total of 10 to 25 establishments in different industries ought to be enough to provide a reasonable test.

Potential problem areas can be spotted by a pilot survey before the full-scale survey gets underway, thus saving time and money. Some revision is almost always necessary, such as changing the sequence or wording of questions or clarifying concepts or definitions. In addition to being a test of the questionnaire design, a pilot survey also serves as a check on the adequacy of instructions to the interviewers. Moreover, the experience gained in this small-scale survey will be valuable for conducting the full-scale survey. On the basis of a careful analysis of the results of the pretest, the questionnaire is reviewed and revised, and interviewer instructions are modified.

Conduct Interviews

There are two major ways of getting the questionnaires completed--by mail or by personal interview. Of the two, the cheaper and faster method is the mail survey. However, in order for a mail survey to succeed, certain conditions in the country must prevail: The mail system must be reliable, and establishments must be able and willing to cooperate in the survey. In most developing countries, neither of these conditions exists. The few cases in which statisticians attempted to conduct surveys by mail produced unsatisfactory or unusable data. It is therefore recommended that, in order to save time in the long run, the personal interview method be incorporated in the early stages of survey planning.

Interviewers can be drawn from many sources as indicated elsewhere in this manual. They should receive at least a week of intensive training in which the purpose and methods of conducting the survey are carefully explained so that they may be prepared for all possible questions or objections raised by the respondents. As an aid in their training, interviewers who will be actually conducting the survey should, if possible, be given an opportunity to observe an experienced enumerator conduct an interview. This type of on-the-job training will enable the interviewer-trainee to understand, and therefore anticipate, the types of questions raised by respondents.

The assignment of establishments to interviewers should be on a geographical basis. Limiting the area of interview not only saves time and money as far as travel is concerned, it enables the interviewers to become acquainted with their assigned areas and to identify new or overlooked establishments.

It is important to impress on interviewers that information obtained from establishments is confidential and must not be revealed in any form which would identify the establishment concerned. This is a very important point which is not often fully appreciated by interviewers.

Process Returns

Processing questionnaires can begin as soon as the completed schedules return to the statistical office; it is not necessary to wait until all are returned. The major steps in processing are as follows: logging, editing, classifying, reviewing, coding, and tabulating. Many of these steps may be performed by one or two clerical workers and supervised by a professional worker. All steps in processing returns must be verified or checked for accuracy. In essence, all clerical work must be done twice if human error is to be held to an acceptable minimum.

Logging. A log or tally should be kept on each schedule as it comes in. This may be simply a checkmark against each establishment name which was included in the sample. Extra columns should be available for recording reinterviews. A typical tally sheet looks like this:

Name of establishment	ID number	Date of receipt	Reinterview #1		Reinterview #2	
			Out (date)	In (date)	Out (date)	In (date)

In order to expedite processing schedules, punch cards, or 3 x 5 cards may be prepared in advance containing the name, address, and the identification number of each establishment in the survey. These cards are then attached to the schedules as they come into the office and checked against each other for accuracy. Attaching prepared cards to schedules also facilitates identification of establishments for which no schedule has been returned. Both schedule and card remain attached until they reach the tabulating clerk or the keypunch operator.

Editing. The editing clerk reviews the schedule for completeness and internal consistency. Items that are questionable or omitted should be noted in blue pencil in the margin of the schedule for the attention of the professional reviewer. Any correspondence or notations made by the interviewer relating to the particular schedule should be attached. The editor separates the schedules into two groups: those ready for classification and tabulation; and other cases (such as inconsistencies, incompleteness,etc.)requiring professional review.

Professional Reviewing. The final decision for questions and problems raised by clerical workers should rest with the professional reviewer. He (not the clerk) may decide, for example, that an omission is so minor that the time and effort involved in obtaining the data are not worth the cost. Inconsistencies or misunderstandings should always be checked out. He may do this either by returning the questionnaire to the interviewer or by telephoning directing to the establishment for clarification. For the purpose of expediting the survey, there should be some limit to the number of reinterviews. As each problem schedule is reviewed and corrected to the satisfaction of the professional, it is ready for the next step in processing.

Classifying. By using the appropriate classification system, information which was reported on the questionnaire can be more easily tabulated. All occupations should be given an occupational classification code on the same line that the occupational information appears. If there is any doubt or question, it should be referred to the professional reviewer for final determination.

Other information reported on the questionnaires may also be used for assigning classification codes for ease in tabulating and analyzing data. Each establishment included in the survey should be assigned code numbers identifying certain basic information, such as (1) the industry of which the establishment is a member, (2) the geographic location of the establishment and, (3) the employment-size class. Other items may also be classified depending on the information available. Industry codes are based on the industrial classification system recommended earlier in this manual; other codes are those of the local office. These codes are generally placed in the official use box on the questionnaire to be used by the tabulating clerk.

Coding. The purpose of coding is to guide tabulators or key-punch operators (if automatic equipment is used) to pick up information directly from the schedule. The coding clerk should make notations in red to enable tabulators or key-punch operators to transfer the information more easily.

In order to make coding procedures uniform, a system should be prepared in advance. Whatever coding system is developed, it should be uniform throughout the survey. The following is an example of standardizing the coding system:

1. Underline, in red, all figures to be punched or copied.

2. Circle figures that should not be punched or copied.

3. Fill in blanks and dashes as follows:

   X = no response or not available (NA)

   0 = none

4. Convert all percentages to whole numbers.

Unusual cases not covered by written instructions should be referred to the supervisor or professional in charge.

When each schedule is completed, the coding clerk should initial the schedule. The clerk in charge should place his initials to indicate approval of the work.

Tabulating Data. The process of data tabulation is the consolidation of all information supplied on the questionnaire. The tabulation may be by hand or by electronic equipment. The results are the totals of each item--occupations in this case. However, because totals alone are not meaningful for economic analysis, they should be regrouped by classifying them according to some other significant information, such as industry, area, or size of establishment.

For ease in tabulating information obtained from schedules, table blanks should be carefully planned in advance by the professional in charge. They may be in more detail in the worksheet stage than necessary for final publication. In order to get the most out of the survey, the data should be manipulated in as many ways as possible, depending on the type of information collected and the amount of time available to the analyst. The table blanks on the following pages are intended to serve only as a guide for presenting information in tabular form.

Estimate Employment

The method of estimating employment was discussed earlier in this chapter. The procedure begins after all data are tabulated. Each item may be blown up to represent the total; however, no information should be published if it represents data from one or two establishments. Because of the confidentiality of the data, some employment-size groups may have to be consolidated. For example, if there are only two firms in the 50-and-over employment-size group, information from this group should be combined with the next lower group.

Analyze Data and Publish Findings

As described in this manual, the purpose of conducting the establishment survey was to obtain estimates of total employment in selected high-level occupations in economic activities for which information was lacking to complete worksheet 1, page 34. These estimates may now be inserted in column 5 (private industry) to arrive at the total for each occupation in all economic activities. To aid in the analysis of the data and to provide manpower planners with useful information, occupational data in the private industry sector should be cross-tabulated into major industry groups: Mining, manufacturing (which should be further divided into the minor industry groups), construction, etc.

Once the tabulations are completed, the manpower consultant prepares a report based on his interpretation of the data. 42/ The report usually takes the form of a narrative, illustrated by tables, describing the employment situation in each important occupation. The main purpose of this report is to present an inventory of current employment in high-level and skilled occupations. However, if additional information was obtained on the number of women, trainees, or foreign nationals employed in each occupation, then these features should also be incorporated to give the report more "flavor." If information on occupational earnings was collected, these data may provide some guidance to the analyst as to the reliability of the reported occupational information. Occupational earnings that are much lower than the norm usually indicate that the designation of that occupation was overstated by labeling, for example, a laboratory assistant as a chemist.

42/ See also Recommendations for the Preparation of Sample Survey Reports, (Provisional Issue), United Nations Statistical Papers, Series C, No. 1, Revision 2, 1964.

Examples of Table Blanks

1. Occupation, by industry.

Occupation	Total	Mining	Manufacturing				
			Total	Food	Beverage	Tobacco	etc.

2. Occupation, by industry and by sex.

Occupation	Total		Mining		Manufacturing (by major industry groups)
	Male	Female	Male	Female	

3. Occupation, by geographic area.

Occupation	Total	Province A	Province B	Province C	etc.

4. Occupation, by size of establishment.

Occupation	Total		Mining		Continue with remaining industries
	50 employees or more	Fewer than 50 employees	50 employees or more	Fewer than 50 employees	

5. Occupation, by country or province of origin.

Occupation	Foreign		Domestic	
	Total	List countries here	Total	List provinces here

Examples of Table Blanks (Continued)

6. Number of trainees in each occupation, by industry.

Occupation	Total	Mining	Manufacturing (by major industry groups)

7. Ratio of trainees to qualified workers in each occupation, by industry.

Occupation	Average ratio	Mining	Manufacturing (by major industry groups)

8. Occupations as percent of total employment in each industry.

Occupation	Percent in all industries	Mining	Manufacturing (by major industry groups)

9. Ratio of technicians to scientists and engineers, by industry.

Industry	Scientists and engineers (Number)	Technicians (subprofessional) (Number)	Ratio of technicians to scientists and engineers

10. Range of occupational earnings, by industry.

Occupation	Mining		Manufacturing (by major industry groups)
	High	Low	

All published reports on manpower estimates should include a short nontechnical description of the techniques used in making the survey. The topics to be discussed may follow the same sequence as listed in this chapter. In addition, a complete detailed description of these techniques should be prepared for the use of the statistical office to provide guidance for other manpower consultants. Included in the technical description should be a discussion of the problems encountered and the methods used for overcoming these problems.

APPENDIX A

Review of Occupational Surveys in Different Countries

Area and country	Title and date of publication	Consultant and/or organization	Occupations covered	Sources of data	Collection method	Comments
AFRICA						
Ethiopia	Ethiopia's High-Level Manpower--Analysis and Projections, Haile Selassie I University, May 1964.	Arnold M. Zack, visiting Fulbright Professor.	Professional, administrative, managerial, and technical. Cards made for each person including age, nationality, education, and experience.	Surveyed 125 nonagricultural establishments, employing 50 workers or more, small professional firms also included.	Personal interview.	Also requested information on current vacancies, recruitment, and training policies.
Ghana	Survey of High-Level Manpower in Ghana, 1960, Accra, Ghana, 1961.	Edward Hollander, Ford Foundation.	Professional, administrative, managerial, technical, and craftsmen.	Surveyed 140 private nonagricultural establishments employing 50 workers or more; and 90 percent labor force in government.	Personal interview questionnaires and introductory letters mailed in advance.	Also requested number of job vacancies.
Kenya	High-Level Manpower Requirements and Resources in Kenya 1964-1970, May 1965.	Calvin F. Davis, Ford Foundation.	Professional, administrative, managerial, sales, clerical, and craftsmen.	Surveyed 348 nonagricultural establishments employing 100 workers or more. Reduced cutoff point in Trade and Services to achieve 40 percent employment coverage. Survey covered 77 percent of total nonagricultural employees.	Personal interview with top management people in government and private firms.	Benchmark data from Planning Office. Requested anticipated requirements 6 years from date of survey.
Liberia	A Pilot Survey of High-Level Manpower in Liberia, September 1961.	William Langbehn, AID	25 selected from professional, administrative, technical, and clerical groups.	Surveyed establishments in major sectors of the economy--excluded agriculture and wholesale and retail trade.	Personal interview following mailed letter of introduction.	Also requested information on current job vacancies and estimates of occupational needs 2 to 5 years from date of survey.

Review of Occupational Surveys in Different Countries--Continued

Area and country	Title and date of publication	Consultant and/or organization	Occupations covered	Sources of data	Collection method	Comments
AFRICA						
Libya----------	A Survey of Requirements of Professional, Technical, and Skilled Manpower in Libya, 1964-69, Benghazi, 1964.	A. N. K. Nair, ILO.	Professional, technical, and craftsmen in government and 3 major industries: petroleum, mining, construction.	Secondary sources: University of Libya, Ministry of Education, and Civil Service Department.	Questionnaire mailed to government agencies and 3 industries.	Also requested anticipated occupational needs.
Mali-----------	Manpower Study for Mali, 1961.	Valmore J. Doucette, AID.	All occupational groups.	Secondary sources: Ministry of Education for list of students studying abroad, 1961 5-year budget plan.	Questionnaires to all ministries; only one replied.	Consultant not permitted to contact agencies or to travel.
Sudan----------	Sudanese Manpower, 1956-65, April 1960.	Edwin S. Crosby, AID.	All occupations and all industries.	Secondary sources: The Education Division of the USOM to Sudan.	No survey.	Analysis of current and projected manpower needs.
Tanzania-------	Human Resources and Manpower Planning in Tanganyika, 1960.	John L. Thurston, Ford Foundation.	Professional, technical, and craftsmen.	Impressionistic approach--interviewed persons most knowledgeable in the various fields.	Personal interview.	No survey. Recommendation led to Tobias Report.
	High-Level Manpower Requirements and Resources in Tanganyika, 1962-67, 1963.	George Tobias, Ford Foundation.	Professional, administrative, technical and highly skilled manual groups.	Surveyed 115 nonagricultural establishments employing 50 workers or more in public and private sectors.	Questionnaires and letters mailed before personal interviews.	Also requested information on occupational needs 2 to 5 years from date of survey.
	Survey of the High-Level Manpower Requirements and Resources for the Five Year Development Plan, 1964-65 to 1968-69, 1965.	R. L. Thomas, Ford Foundation.	Professional, administrative, managerial, technical, clerical, and highly skilled manual groups.	Surveyed 108 employers in private and public nonagricultural sectors. All establishments employing 100 workers or more. Sample of establishments employing 50-99.	Personal interviews.	

Review of Occupational Surveys in Different Countries--Continued

Area and country	Title and date of publication	Consultant and/or organization	Occupations covered	Sources of data	Collection method	Comments
AFRICA						
Tunisia----------	Rapport au Gouvernement de la Republique Tunisienne sur L'Evaluation et la Planification de la Main-D'Oeuvre, 1961, 1965.	M. Edgar-Louis Grose, ILO.	All occupational groups.	Secondary sources: Economic Plan, University of Tunis, and previous survey.	No survey.	
Uganda----------	Survey of Manpower and Training in the Uganda Protectorate, 1959.	R. L. Thomas, Ford Foundation.	Professional, administrative, managerial, technical, and skilled manual groups.	Surveyed 102 employers including government representing 82 percent nonagricultural employment.	Personal interviews and information from educational and other institutions, and records of individuals studying abroad.	Also requested information on anticipated needs, current job vacancies, and number of employees being trained.
ASIA						
Indonesia-------	Manpower in Indonesia, May 10, 1961.	E. A. Nelson. AID.	Craftsmen in construction. metalworking, electrical, and automotive maintenance and repair.	8-year Development Plan.	No survey.	Analysis and evaluation of existing data.
Korea-----------	Far East Manpower Assessment and Educational Planning Seminar, "Status of Manpower Planning in Korea" December 1964.	Manpower Survey I, 1961.	Technicians, craftsmen, and engineers.	Surveyed 1,765 establishments employing 50 workers or more and a sample of establishments employing less than 50, government offices, and science and engineering schools.	Personal interview.	See also: First Five-year Plan for Technical Development, 1962-1966, Supplement to First Five-year Economic Plan, October 15, 1962.

Review of Occupational Surveys in Different Countries--Continued

Area and country	Title and date of publication	Consultant and/or organization	Occupations covered	Sources of data	Collection method	Comments
ASIA						
Korea--cont'd---	Same source.	Manpower Survey II, 1963.	Essentially the same, but occupations are better defined.	Essentially the same, but included Armed Forces.	Personal interview.	Not strictly comparable with 1961 because of changes in occupational definitions.
	Manpower Development and Utilization in Korea, May 7, 1966.	Edgar C. McVoy, AID.	All occupational groups and selected occupations.	Secondary sources: Manpower surveys of 1961 and 1963. (See above.) Census of Population 1960, Sample of the labor force, Establishment surveys 1963 and 1964, Bank of Korea, annual survey of education.	No survey.	Primarily recommendation for improving the manpower planning and development programs.
New Zealand-----	Scientific and Engineering Manpower in New Zealand Industry, 1958.	J. T. O'Leary and Robert Shaffer	Supervisory positions sales, production, testing and research development.	Manufacturing and other economic activities which employ scientists and engineers.	Mailed questionnaires to scientists and engineers, 78 percent responded.	Master list compiled from registers, directories and membership lists.
Taiwan----------	Far East Manpower Assessment and Education Planning Seminar, Manila, February 1965. "Manpower Assessment and Education Planning Status of the Republic of China," May 1962.	Stanford Research Institute.	High-level occupations requiring education and training.	Educational institutions and economic development plan.	3 surveys by personal interview.	Supply-demand projections of high-level manpower based on secondary sources.

Review of Occupational Surveys in Different Countries--Continued

Area and country	Title and date of publication	Consultant and/or organization	Occupations covered	Sources of data	Collection method	Comments
ASIA						
Taiwan--cont'd--	A Report on the Pilot Survey of Manpower Requirements in Taiwan, Taiwan, October 1964.	Labor Force Survey Research Group.	All occupations.	Sample of 1,084 manufacturing establishments (out of 52,000) as follows: 10-19 workers--4 percent coverage 20-99 workers--25 percent coverage 100 and over--total coverage.	Personal interview following letter of introduction.	Also requested current job vacancies.
	Manpower Requirement Survey Report on Manufacturing Industries in Taiwan, December 1964.	Labor Force Survey Research Group.	All occupations.	Sample of 1,656 manufacturing establishments as follows: 1-3 workers--1.07 percent coverage 4-9 workers--2.5 percent coverage 10-19 workers--4.16 percent coverage 20-99 workers--25.02 percent coverage 100 and over--total coverage.	Personal interview.	
	Manpower Requirement Pilot Survey on Service Industries in Taiwan, March 1965.	Labor Force Survey Research Group.	All occupations.	Surveyed 1,000 establishments (out of 26,000) in Recreation and Personal Service industries.	Personal interview following mailed letter of introduction.	
	Report to the Government of the Republic of China on Manpower Assessment and Planning, Geneva 1965.	Alice W. Shurcliff ILO.	2-digit groups and 5-digit medical and teacher personnel.	1965 Quarterly Labour Force Survey data from Ministry of Education.	Analysis and evaluation of existing statistical data.	Recommendations for improving current data-collection proceedings. Recommendations for implementing supply-demand forecasting survey.

Review of Occupational Surveys in Different Countries--Continued

Area and country	Title and date of publication	Consultant and/or organization	Occupations covered	Sources of data	Collection method	Comments
ASIA						
Thailand--------	Preliminary Assessment of Education and Human Resources in Thailand, 1963.	Eugene W. Burgess, Cole Brembeck, and William Platt, AID.	All occupational groups and a few selected occupations.	Labor force data from 1960 Census of Population. Ministry of Education Planning Board.	Questionnaire.	Projection of supply-demand levels of important high-level occupations.
EUROPE						
Belgium---------	Human Resources Assessment and Planning: Procedural and Methodological Considerations, Pan American Union, 1962.		Scientists and technical personnel.	Surveyed private and public sectors.	Letter of introduction, followed by personal interview.	Also requested future demand.
France----------	Avenir de la Profession de Statisticien Preliminary study, June 1965.	University of Paris.	Statisticians in all fields.	Private industry and government.	Personal interviews.	Study in depth of training and employment of statisticians.
Germany---------	Methods of Forecasting Demand for and Supply of Scientists and Engineers, 1958.	Harold Goldstein, OECD.	Engineers by education, branch, and function.	Surveyed industrial associations, government agencies, and research organizations.	Mailed questionnaires.	Also requested job vacancies and future demand.
Ireland---------	Training of Technicians in Ireland, Reviews of National Policies for Science and Education, December 1964.	Organisation for Economic Co-operation and Development.	Professional, managerial, technical, and craftsmen operatives.	Surveyed 24 firms. 1 from each major industry.	Personal interviews by technical school inspectors for Department of Education.	1961 survey conducted by Central Statistics Office of the Irish Government---2,400 persons involved.

Review of Occupational Surveys in Different Countries--Continued

Area and country	Title and date of publication	Consultant and/or organization	Occupations covered	Sources of data	Collection method	Comments
EUROPE						
Italy----------	Human Resources Assessment and Planning: Procedural and Methodological Considerations, Pan American Union, 1962.		All high-level occupations.	Secondary sources from existing surveys and official statistics data.	No survey.	Analyzed data by North and South regions.
	The Mediterranean Regional Project, Country Reports, 1965.	Organisation for Economic Co-operation and Development.	All major occupational groups.	Secondary sources.	No survey.	Projections made to anticipate educational needs.
Netherlands-----	Employment Forecasting, International Seminar on Employment Forecasting Techniques, Chateau de Karreveld, Brussels, 1962.	Organisation for Economic Co-operation and Development.	All high-level professionals, and graduates of universities, by subject, etc.	Secondary sources: 1947 and 1960 Censuses of Population, Labor Exchange Registers, Membership directories of professional associations.	No survey.	
Portugal--------	Mediterranean Regional Projects, Country Reports, 1964.	Organisation for Economic Co-operation and Development.	Scientific, technical, and skilled occupations.	Surveyed secondary and tertiary sectors, classified by size of firm from which a random choice was made in each class. (See text.)		Survey of establishments and public services made in 1961. No prior information.
Spain-----------	Mediterranean Regional Projects, Country Reports, 1965.	Organisation for Economic Co-operation and Development.	Scientific, technical, and skilled occupations.	Surveyed 600 firms in industrial sector; supplemented by government educational statistics, enrollments in schools and universities.	Questionnaires sent to all employees in surveyed firms. Personal interview with employers.	Requested information on personal characteristics of workers and methods of acquiring skills.

Review of Occupational Surveys in Different Countries--Continued

Area and country	Title and date of publication	Consultant and/or organization	Occupations covered	Sources of data	Collection method	Comments
EUROPE						
Sweden----------	Methods of Forecasting Demand for and Supply of Scientists and Engineers, 1956.	Swedish Association of Industries.	Engineers, mathematicians, physicists, and chemists.	Surveyed 1,550 firms in manufacturing, and handicraft industries, government agencies, transportation, communication, electric power, and commerce.	Mailed questionnaire, supplemented by personal interview when response was not complete.	
United Kingdom--	Human Resources Assessment and Planning: Procedural and Methodological Considerations, Pan American Union, 1962.	Ministry of Labour	Engineers and scientists.	1956 Stratified sample of public and private industry. Survey included all establishments employing 500 or more workers; and 1/4 with 200-499 workers; and 1/12 with 100-199 workers.	Mailed questionnaires.	Also requested job vacancies and future demand.
				1959 Sample expanded to include 1/16 of establishments employing 50-99 workers, and 1/48 of those with 11-49 workers.		
	Ministry of Labour Gazette, "Industry's Needs for Scientific Manpower," February 1965.	Ministry of Labour	Scientists and technical supporting staff.	Surveyed 11,000 manufacturing, government, and service establishments employing 500 or more workers and a sample of those employing fewer than 500.	Mailed questionnaires.	Cooperation of all employer organizations.

Review of Occupational Surveys in Different Countries--Continued

Area and country	Title and date of publication	Consultant and/or organization	Occupations covered	Sources of data	Collection method	Comments
EUROPE						
Yugoslavia------	Mediterranean Regional Project, Country Reports, 1964.	Organisation for Economic Co-operation and Development.	Major categories, of occupations, such as white-collar workers, by skill levels; and other workers by skill level. No individual occupations were investigated.	Secondary sources: Statistical yearbooks, Planning boards, and Bureau of Statistics.	Mailed questionnaires.	Analysis depended on university output.
LATIN AMERICA						
Argentina-------	Informe Metodologico Recursos Humanos, Argentina, Buenos Aires, 1964.	Enrique Orteiza, Centro de Investigaciones Economicas, Instituto Torcuato di Tella.	Professional, administrative, managerial, and technical.	Surveyed 2,000 firms employing 100 workers and more. List from Industrial Census of 1954, updated from other sources.	Pretest of 50 firms in 2 large areas. Personal interview.	Excellent description of the method used for the study, Los Recursos-Humanos de Nivel en la Republica de Argentina.
Boliva----------	Survey of the Comibol Mines, 1964 (Labor force in nationalized mines).	AID Manpower Division in Bolivia.	All occupational groups, coded by U.S. Dictionary of Occupational Titles.	USAID/B Controllers office; USEmbassy/B; technical budget of national social security program; establishment survey.	Personal interview.	Interviews by Department of Census and Statistics and by Peace Corps workers.
British Honduras--------	Manpower Assessment Report, 1964, Belize City, 1966.	Osmond W. Francis, ILO.	All occupations in all economic activities.	All establishments employing 5 workers or more.	Mail questionnaires followed by personal interviews with nonrespondents.	Supplementary manuals of instructions for organizing and conducting the manpower program.

Review of Occupational Surveys in Different Countries--Continued

Area and country	Title and date of publication	Consultant and/or organization	Occupations covered	Sources of data	Collection method	Comments
LATIN AMERICA						
Chile----------	Necesidades de Mano de Obra Especializada en Alguhas Actividades Industriales en las Areas Economicas de Santiago y Concepcion. Santiago de Chile, 1962.	Ministerio del Trabajo y Prevision Social.	Professional, technical, foremen, and craftsmen.	Surveyed stratified sample of 580 establishments in textiles, wood products, glass, and all metal product industries.	Personal interviews.	Used university students as interviewers.
	La Emigracion de Recursos Humanos de Alto Nivel y el Caso de Chile, 1965.	Pan American Union.	All occupations requiring university education.	5 percent sample of professionals residing in United States.	Mailed questionnaire.	List of names of Chilean residents, supplemented by U.S. Department of Justice, and by friends and acquaintances in U.S.
Colombia-------	Recursos y Requerimientos de Personal de Alto Nivel, 1963-1970, 1964.	Instituto Colombiano de Especializacion Technica en el Exterior (ICETEX)	Professional, administrative, managerial, and technician, by name, sex, and age of incumbent, and by number of current job vacancies and estimate of future requirements.	Surveyed 1,884 manufacturing establishments employing 50 or more persons, government agencies, hospitals, schools, nonprofit institutions, and be self-employed (list obtained from professional societies and university records).	Personal interviews.	Excellent description of each step in carrying out survey, including sample questionnaires and interview instructions.
	Status of ICETEX Survey of High-Level Human Resources in Colombia, July 15, 1963.	William A. Langbehn, AID.	Review of ICETEX survey (previous entry) and description of recommended techniques for carrying out surveys of high-level manpower.			
	A Comprehensive Manpower Planning Programme for Colombia, 1964.	M. Vasudevan, ILO	Review of ICETEX survey and recommendations for projecting supply and demand of high-level manpower.			

Review of Occupational Surveys in Different Countries--Continued

Area and country	Title and date of publication	Consultant and/or organization	Occupations covered	Sources of data	Collection method	Comments
LATIN AMERICA						
Guyana----------	An Assessment of High-Level Manpower Requirements in Relation to British Guiana's Need for Economic Development. 1962.	Robert L. Thomas, AID.	Professional, managerial, and technical. occupations.	Surveyed nonagricultural establishments employing 100 workers or more and all government agencies.	Personal interview.	Primarily Georgetown area. representing 90 percent coverage.
NEAR EAST						
Cyprus----------	Report on the Second Larnaca Manpower Survey, October 1964.	Ministry of Labour and Social Insurance. Labour Research and Statistics Section.	Major occupations.	Surveyed 151 nonagricultural private and public establishments employing 5 workers or more and 31 establishments employing less than 5.	Personal interview.	Survey covered 85 percent of workers used in area. Included labor turnover statistics and employer estimates of future needs.
Greece----------	Mediterranean Regional Projects, Country Reports, Paris. 1965.	Organisation for Economic Co-operation and Development.	All high-level occupations reported in the 1961 census.	Secondary sources: 1961 Census of Population, 1957 industrial survey of large firms, 1955 special survey of primary school buildings.	No survey.	Projections in all economic sectors.
Iran------------	National Manpower Resources and Requirements Survey, Tehran, 1958.	Ministry of Labor and Plan Organization.	46 high-level professions selected from ILO's ISCO.	Surveyed 2,749 establishments employing 50 employees or more and sampled 15,510 establishments with fewer than 50 workers.	Personal visits to establishments and educational institutions and mailed questionnaires to all college graduates.	

Review of Occupational Surveys in Different Countries--Continued

Area and country	Title and date of publication	Consultant and/or organization	Occupations covered	Sources of data	Collection method	Comments
NEAR EAST						
Iran--cont'd----	High-Level Manpower Development in Iran, May 1960.	T. Hilliard Cox Governmental Affairs Institute.	50 selected professional, administrative, technical, and scientific occupations.	Secondary sources: National manpower resources and requirements survey, universities and technical institutes, Ministry of Education.	Interviews with heads of educational institutions.	Study was an analysis of supply and demand of high-level manpower projected to 1963.
	Employment Status and Educational Characteristics of Scientific, Professional and Technical personnel, Tehran, 1961.	Plan Organization.	High-level 5-digit occupations requiring university degree.	All firms in 1958 manpower survey. Individual forms for each employed person.	Personal interview.	Created national register of high-level manpower.
Israel----------	Manpower Survey, Doctors, Ministry of Labor, Tel-Aviv, May 1964.	Herbert Smith.	Doctors of Medicine.	Lists of physicians obtained from administrative and licensing records maintained by Ministry of Health; and Administrative Census of Doctors, 1962.	Mail questionnaire.	Results showed 6,000 doctors or 1 in 4,000 population.
Turkey----------	Manpower Planning in Turkey, 1962-1964, May 1964.	Edgar C. McVoy, AID.	50 selected occupations from scientific, managerial, and technical categories.	Health Manpower Survey conducted by Ministry of Health. Teacher Manpower Survey conducted by Ministry of Education. Public Sector Manpower Survey conducted by the statistical office.	No survey.	Report is an analysis of manpower situation including a discussion of various manpower studies which were in the planning stage.
	Mediterranean Regional Project, Country Reports, Paris, 1965.	Organisation for Economic Co-operation and Development.	Major high-level occupations.	Secondary sources: 1960 Census of Population projected to 1962.	No survey.	Projections made to anticipate educational needs.

APPENDIX B

International Standard Industrial Classification of All Economic Activities-- List of Divisions, and Major Groups 1/

Major Group	
	Division 0. Agriculture, Forestry, Hunting and Fishing
01	Agriculture and livestock production
02	Forestry and logging
03	Hunting, trapping and game propagation
04	Fishing
	Division 1. Mining and Quarrying
11	Coal mining
12	Metal mining
13	Crude petroleum and natural gas
14	Stone quarrying, clay and sand pits
19	Other non-metallic mining and quarrying
	Divisions 2-3. Manufacturing
20	Food manufacturing industries, except beverage industries
21	Beverage industries
22	Tobacco manufactures
23	Manufacture of textiles
24	Manufacture of footwear, other wearing apparel and made-up textile goods
25	Manufactures of wood and cork, except manufacture of furniture
26	Manufacture of furniture and fixtures
27	Manufacture of paper and paper products
28	Printing, publishing and allied industries
29	Manufacture of leather and leather products, except footwear and other wearing apparel
30	Manufacture of rubber products
31	Manufacture of chemicals and chemical products
32	Manufacture of products of petroleum and coal
33	Manufacture of non-metallic mineral products except products of petroleum and coal
34	Basic metal industries
35	Manufacture of metal products except machinery and transport equipment
36	Manufacture of machinery except electrical machinery
37	Manufacture of electrical machinery, apparatus, appliances and supplies
38	Manufacture of transport equipment
39	Miscellaneous manufacturing industries

1/ For the complete classification, including a description of the industries, see United Nations, International Standard Industrial Classification of All Economic Activities, Statistical Papers, Series M, No. 4, Rev. 1, New York, 1959.

International Standard Industrial Classification of All Economic Activities--Continued

Major Group	
	Division 4. Construction
40	Construction
	Division 5. Electricity, Gas, Water and Sanitary Services
51	Electricity, gas and steam
52	Water and sanitary services
	Division 6. Commerce
61	Wholesale and retail trade
62	Banks and other financial institutions
63	Insurance
64	Real estate
	Division 7. Transport, Storage and Communication
71	Transport
72	Storage and warehousing
73	Communication
	Division 8. Services
81	Government services
82	Community and business services
83	Recreation services
84	Personal services
	Division 9. Activities Not adequately Described
90	Activities not adequately described

APPENDIX C

International Standard Classification of Occupations:
Major, Minor, and Unit Groups 1/

Major Group 0: Professional, Technical, and Related Workers

0-0	Architects, Engineers, and Surveyors
0-1	Chemists, Physicists, Geologists, and Other Physical Scientists
0-2	Biologists, Veterinarians, Agronomists, and Related Scientists
0-3	Physicians, Surgeons, and Dentists
0-4	Nurses and Midwives
0-5	Professional Medical Workers, Not Elsewhere Classified, and Medical Technicians
0-6	Teachers
0-7	Clergy and Related Members of Religious Orders
0-8	Jurists
0-9	Artists, Writers, and Related Workers
0-X	Draughtsmen, and Science and Engineering Technicians Not Elsewhere Classified
0-Y	Other Professional, Technical, and Related Workers

Major Group 1: Administrative, Executive, and Managerial Workers

1-0	Administrators and Executive Officials, Government
1-1	Directors, Managers, and Working Proprietors

Major Group 2: Clerical Workers

2-0	Bookkeepers and Cashiers
2-1	Stenographers and Typists

Major Group 3: Sales Workers

3-0	Working Proprietors, Wholesale and Retail Trade
3-1	Insurance and Real-Estate Salesmen, Salesmen of Securities and Services, and Auctioneers
3-2	Commercial Travellers and Manufacturers' Agents
3-3	Salesmen, Shop Assistants, and Related Workers

Major Group 4: Farmers, Fishermen, Hunters, Loggers, and Related Workers

4-0	Farmers and Farm Managers
4-1	Farm Workers, Not Elsewhere Classified
4-2	Hunters and Related Workers
4-3	Fishermen and Related Workers
4-4	Loggers and Other Forestry Workers

1/ International Standard Classification of Occupations, International Labour Office, Geneva, 1958. 236 pp.

International Standard Classification of Occupations: Major, Minor and Unit Groups--Continued

Major Group 5: Miners, Quarrymen, and Related Workers

5-0	Miners and Quarrymen
5-1	Well Drillers and Related Workers
5-2	Mineral Treaters
5-9	Miners, Quarrymen, and Related Workers Not Elsewhere Classified

Major Group 6: Workers in Transport and Communication Occupations

6-0	Deck Officers, Engineer Officers, and Pilots, Ship
6-1	Deck and Engine-Room Ratings (Ship), Barge crews, and Boatmen
6-2	Aircraft Pilots, Navigators, and Flight Engineers
6-3	Drivers and Firemen, Railway Engine
6-4	Drivers, Road Transport
6-5	Conductors and Brakemen, Railway
6-6	Inspectors, Supervisors, Traffic Controllers, and Despatchers, Transport
6-7	Telephone, Telegraph, and Related Telcommunication Operators
6-8	Postmen and Messengers
6-9	Workers in Transport and Communication Occupations Not Elsewhere Classified

Major Group 7/8: Craftsmen, Production-Process Workers, and Labourers Not Elsewhere Classified

7-0	Spinners, Weavers, Knitters, Dyers, and Related Workers
7-1	Tailors, Cutters, Furriers, and Related Workers
7-2	Leather Cutters, Lasters, and Sewers (except Gloves and Garments) and Related Workers
7-3	Furnacemen, Rollers, Drawers, Moulders, and Related Metal Making and Treating Workers
7-4	Precision-Instrument Makers, Watchmakers, Jewellers, and Related Workers
7-5	Toolmakers, Machinists, Plumbers, Welders, Platers, and Related Workers
7-6	Electricians and Related Electrical and Electronics Workers
7-7	Carpenters, Joiners, Cabinetmakers, Coopers, and Related Workers
7-8	Painters and Paperhangers
7-9	Bricklayers, Plasterers, and Construction Workers Not Elsewhere Classified
8-0	Compositors, Pressmen, Engravers, Bookbinders, and Related Workers
8-1	Potters, Kilnmen, Glass and Clay Formers, and Related Workers
8-2	Millers, Bakers, Brewmasters, and Related Food and Beverage Workers
8-3	Chemical and Related Process Workers

International Standard Classification of Occupations: Major, Minor and Unit Groups--Continued

8-4	Tobacco Preparers and Tobacco-Product Makers
8-5	Craftsmen and Production-Process Workers Not Elsewhere Classified
8-6	Packers, Labellers, and Related Workers
8-7	Stationary-Engine and Excavating and Lifting Equipment Operators and Related Workers
8-8	Longshoremen and Related Freight Handlers
8-9	Labourers Not Elsewhere Classified

Major Group 9: Service, Sport, and Recreation Workers

9-0	Fire Fighters, Policemen, Guards, and Related Workers
9-1	Housekeepers, Cooks, Maids, and Related Workers
9-2	Waiters, Bartenders, and Related Workers
9-3	Building Caretakers, Cleaners, and Related Workers
9-4	Barbers, Hairdressers, Beauticians, and Related Workers
9-5	Launderers, Dry Cleaners, and Pressers
9-6	Athletes, Sportsmen, and Related Workers
9-7	Photographers and Related Camera Operators
9-8	Embalmers and Undertakers
9-9	Service, Sport, and Recreation Workers Not Elsewhere Classified

Major Group X: Workers Not Classifiable by Occupation

X-1	New Workers Seeking Employment
X-2	Workers Reporting Occupations Unidentifiable or Inadequately Described
X-3	Workers Not Reporting Any Occupation

Armed Forces: Members of the Armed Forces

APPENDIX D

Occupational Classification System Suggested for Use in Making High-Level Manpower Assessments

The following classification system was used in the OECD Mediterranean Project. 1/ The system categorizes all the occupations in the ISCO 2/ into four groups according to the educational and training requirements of the occupations. All code numbers are those of the ISCO which should be consulted for the detailed content of each occupational category, and for the definitions of the occupations.

Class A

Scientific and Technical Occupations

1. Architects (unit group 0-01).
2. Engineers (unit group 0-02).
3. Physical scientists and mathematicians (minor group 0-1; occupation 0-Y9.35).
4. Biologists, veterinarians, agronomists, and related scientists (minor group 0-2).
5. Professional medical personnel.
   a) Physicians and surgeons (unit group 0-31).
   b) Dentists (unit group 0-32).
   c) Other professional medical workers (unit group 0-51, 0-52, 0-59).
6. University teachers, sciences (occupation 0-61.30).
7. Secondary school teachers, sciences (occupation 0-69.40). 3/

1/ Herbert S. Parnes, Forecasting Educational Needs for Economic and Social Development, Organisation for Economic Co-operation and Development, The Mediterranean Regional Project, October 1962. 113 pp.

2/ International Standard Classification of Occupations, International Labour Office, Geneva, 1958. 236 pp.

3/ The ISCO does not differentiate between teachers of science and other teachers at the secondary level. For purposes of the classification system for the OECD project, therefore, ISCO occupation 0-69.40 was divided into two sub-groups.

Occupational Classification System Suggested for Use in Making High-Level Manpower Assessments--Continued

Other Class A Occupations

8. Administrative, executive, and managerial workers (major group 1).
   a) Administrative and executive officials, government (minor group 1-0).
   b) Directors, managers, and working proprietors (minor group 1-1). 4/
9. University teachers, except sciences (occupations 0-61.20, 0-61.90).
10. Teachers not elsewhere classified (not including elementary and nursery school teachers) (occupation 0-69.90).
11. Secondary school teachers, except sciences (occupation 0-69.40). 3/
12. Economists, professional accountants, actuaries, and statisticians (unit groups 0-Y1, 0-Y4).
13. Social scientists other than economists (minor group 0-8; unit group 0-Y2, occupations 0-Y9.20, 0-Y9.23, 0-Y9.26, 0-Y9.29, 0-Y9.32, 0-Y9.38, 0-Y9.41, 0-Y9.44, 0-Y9.47).
14. Artists, writers, and related creative artists (minor group 0-9).
15. Class A workers not elsewhere classified (minor group 0-7; unit group 0-Y3; occupations 0-Y9.50, 0-Y9.59, 0-Y9.90).

Class B

16. Science and engineering technicians and draughtsmen (minor group 0-X).

   a) Technicians, engineering (occupation 0-X9.20).
   b) Technicians, research laboratory (occupation 0-X9.30).
   c) Technicians, industrial laboratory (occupation 0-X9.40).
   d) Science and engineering technicians not elsewhere classified and laboratory assistants (occupation 0-X9.90).
   e) Draughtsmen (unit group 0-X1).
17. Surveyors (unit group 0-03).
18. Medical and dental technicians (unit group 0-53; occupation 7-41.45).
19. Nurses, professional (unit group 0-41).
20. Class B workers in transport and communications.
   a) Deck officers, engineer officers, and pilots, ship (minor group 6-0).
   b) Aircraft pilots, navigators, and flight engineers (minor group 6-2).
   c) Radio-communication operators (unit group 6-72).
   d) Inspectors, traffic controllers, and despatchers (minor group 6-6, except occupations 6-62.40 and 6-62.50; unit group 6-93).

4/ Note that working proprietors in wholesale and retail trade are excluded from this category and included among sales workers. Other proprietors "who are not primarily directing and managing enterprises or services, but principally perform professional, technical, craft, service or other functions" are also excluded from this category and are classified according to the particular function they perform. (See definition of minor group 1-1.)

Occupational Classification System Suggested for Use in Making High-Level Manpower Assessments--Continued

21. Non-working foremen. 5/
22. Primary and nursery school teachers (occupations 0-69.30 and 0-69.20).
23. Salesmen of insurance and securities (occupations 3-11.20, 3-11.40, 3-11.70, 3-11.90).
24. Class B workers not elsewhere classified (minor group 9-7; minor group 9-8, except occupation 9-81.90; occupations 0-Y9.53, 0-Y9.56, 0-Y9.62, 0-Y9.65, 0-Y9.90, 6/ 7-61.50, 7-69.40).

Class C

25. Clerical workers (major group 2).
26. Sales workers not elsewhere classified (major group 3, except unit groups 3-32 and 3-39 and occupations 3-11.20, 3-11.40, 3-11.70, and 3-11.90).
27. Skilled manual workers. 7/
28. Skilled service and recreation workers. 7/
29. Athletes, sportsmen, and related workers (minor group 9-6).

Class D

30. Farmers, fishermen, hunters, loggers, and related workers (major group 4).
    - a) Farmers and farm managers (minor group 4-0).
    - b) Farm workers not elsewhere classified (minor group 4-1).
    - c) Hunters, fishermen, loggers, and related workers (minor groups 4-2, 4-3, and 4-4).
31. Unskilled sales workers (unit groups 3-32 and 3-39).
32. Unskilled manual workers. 7/
33. Unskilled service and recreation workers. 7/

5/ There is no category of "foremen" in the ISCO. Non-working foremen should be classified here. Working foremen are classified in the same occupation as the workers they supervise.

6/ Code number 0-Y9.90 is included here as well as under Class A occupations. This is a residual group, "Professional, technical and related workers not elsewhere classified, other." It is intended that professional occupations not elsewhere classified will be included in Class A, while semi-professional occupations not elsewhere classified will be included here.

7/ For detailed content, see Parnes, op. cit., pp 81-87.

APPENDIX E

Number and Percent Distribution of Professional and Administrative Occupational Groups in Selected Countries

Area and Country	Date	Total employment (thousands)	Professional, technical and related occupational groups		Administrative, executive, and managerial occupational groups	
			Number (thousands)	Percent of total	Number (thousands)	Percent of total
AFRICA						
Ghana	1960	2,725	60	2.2	13	0.5
Liberia	1962	412	8	1.8	2	0.5
Mauritius	1962	187	9	4.7	2	1.0
Morocco	1960	3,254	98	3.0	15	0.5
South West Africa	1960	203	4	2.0	1	0.6
U.A.R. (Egypt)	1960	6,898	214	3.1	74	1.0
Zambia	1961	33	6	18.4	3	9.7
AMERICA						
Antilles Netherlands	1960	60	5	7.9	3	4.2
Barbados	1960	92	4	4.7	3	2.9
British Honduras	1960	175	10	5.8	5	2.7
Canada	1965	6,911	774	11.2	603	8.7
Costa Rica	1963	395	21	5.2	5	1.3
Dominica	1960	23	1	3.9	[1]	2.4
Ecuador	1962	1,443	47	3.3	5	0.3
Greenland	1960	12	1	7.6	[1]	0.7
Grenada	1960	27	1	4.7	1	3.2
Guyana (formerly British Guiana)	1960	175	10	5.8	5	2.7
Honduras	1961	568	14	2.5	3	0.6
Jamaica	1960	655	18	2.8	7	1.1
Martinique	1961	92	5	5.6	1	0.7
Mexico	1960	11,332	410	3.6	95	0.8
Nicaragua	1963	475	12	2.6	1	0.3
Panama	1960	337	15	4.5	7	2.1
Paraguay	1962	617	20	3.2	5	0.8
Peru	1961	3,125	103	3.3	45	1.5
Puerto Rico	1960	594	46	7.8	84	14.2

See footnote and source at end of table.

Number and Percent Distribution of Professional and Administrative Occupational Groups in Selected Countries--Continued

Area and Country	Date	Total employment (thousands)	Professional, technical and related occupational groups		Administrative, executive, and managerial occupational groups	
			Number (thousands)	Percent of total	Number (thousands)	Percent of total
AMERICA--Continued						
Santa Lucia.....	1960	31	1	3.3	1/	1.9
St. Vincent.....	1960	25	2	5.1	1/	2.6
El Salvador.....	1961	807	20	2.5	2	0.2
Trinidad and Tobago.........	1960	278	19	6.7	7	2.5
United States...	1960	69,877	7,544	10.8	5,489	7.9
Venezuela.......	1961	2,407	125	5.2	40	1.6
ASIA						
Brunei..........	1960	25	2	6.5	1/	2.0
Cambodia........	1962	2,561	75	2.9	7	0.3
China (Taiwan)..	1956	2,993	94	3.1	54	1.8
Cyprus..........	1960	235	9	4.0	2	0.8
Hong Kong.......	1961	1,212	56	4.6	37	3.0
India...........	1961	188,676	3,236	1.7	1,811	1.0
Iran............	1956	6,067	94	1.6	29	0.5
Israel..........	1964	881	104	11.8	135	15.3
Japan...........	1964	47,860	2,350	4.9	1,070	2.2
Jordan..........	1961	390	16	4.1	2	0.6
Malaysia:						
Sabah..........	1960	177	3	1.8	1	0.4
Sarawak........	1960	294	6	2.1	1	0.3
Pakistan........	1961	30,206	414	1.4	132	0.4
Philippines.....	1962	10,266	285	2.8	358	3.4
Ryukyu..........	1964	415	14	3.4	6	1.4
Singapore.......	1957	480	23	4.7	9	1.9
South Korea.....	1964	8,894	172	1.9	59	0.7
Syria...........	1964	1,265	39	3.0	29	2.3
Thailand........	1960	13,837	174	1.3	26	0.2

See footnote and source at end of table.

Number and Percent Distribution of Professional and Administrative Occupational Groups in Selected Countries--Continued

Area and Country	Date	Total employment (thousands)	Professional, technical and related occupational groups		Administrative, executive, and managerial occupational groups	
			Number (thousands)	Percent of total	Number (thousands)	Percent of total
EUROPE						
Austria.........	1961	3,370	229	6.8	116	3.5
Belgium.........	1961	3,512	281	8.0	92	2.6
Denmark.........	1960	2,094	164	7.8	35	1.7
Finland.........	1960	2,033	167	8.2	33	1.6
Greece..........	1961	3,639	125	3.4	27	0.7
Hungary.........	1963	4,790	391	8.2	72	1.5
Ireland.........	1961	1,108	79	7.1	13	1.2
Italy...........	1964	20,130	1,090	5.4	1,630	8.1
Luxembourg......	1960	130	9	6.9	2	1.7
Netherlands.....	1960	4,169	382	9.2	129	3.1
Norway..........	1960	1,406	113	8.0	44	3.2
Portugal........	1960	3,424	92	2.7	43	1.3
Spain...........	1964	12,063	371	3.1	115	0.9
Sweden..........	1960	3,244	417	12.9	69	2.1
Switzerland.....	1960	2,512	225	8.9	31	1.2
Turkey..........	1960	12,993	214	1.6	339	2.6
Yugoslavia......	1961	8,340	469	5.6	94	1.1
OCEANIA						
Fiji............	1956	93	5	5.6	5	5.0
New Zealand.....	1961	895	84	9.4	51	5.7
Western Samoa...	1961	28	2	7.8	2	6.4

1/ Less than 500.

Source: 1965 Yearbook of Labour Statistics. International Labour Office. Twenty-fifth Issue, Geneva 1966, table 2B. pp. 132 - 225.

APPENDIX F-1

Example of letter used in a personal-interview survey

MINISTRY OF LABOR

Dear Sir:

The increasing importance of high-level and skilled manpower to our country's economic development program makes it imperative to have current information on the nation's resources of these people. The Ministry of Labor is planning to conduct a manpower survey to obtain employment information from all employers in the private and public sectors. The data collected will be of considerable value to the Government in framing its educational and vocational training policies.

Your participation in this survey is extremely important to its success since your organization is an essential part of a carefully designed sample. A representative of the Ministry of Labor will call on you sometime during the next few weeks to request information from you regarding the number and types of workers you employ. It is hoped that you will extend your cooperation in this work of national importance.

All replies will be kept strictly confidential. They will not be published in any way which would permit identification of any company. Data will be released only in the form of statistical summaries. If you have any questions about the survey, please write me.

We shall be very grateful for your cooperation.

Sincerely yours,

Minister of Labor

APPENDIX F-1

Sample Questionnaire--Personal Interview

Government of (country)
Ministry of Labor

CONFIDENTIAL
Information furnished on this
return will not be published
in any form which will identify
the establishment concerned.

FOR OFFICIAL USE ONLY
ISIC ______________
Area ______________
Firm ______________

MANPOWER SURVEY OF 1966

1. Name of establishment: ______________________________

2. Address ______________________________

____

3. Names and locations of subsidiaries of branches included in this report:

a. ______________ b. ______________ c. ______________

4. Nature of business: ______________________________

5. Total number of full-time paid workers on (date) ______________

6. Name of person making report: ______________________________

Signature: ______________________________

7. Name of interviewer: ______________________________

(date)

8. Occupational data: Please supply the number of employees in each of the following occupations.

Code	Occupation	Employment as of (date) excluding trainees			Basic pay range	Trainees as of (date)
		Total	Men	Women		
		(a)	(b)	(c)	(d)	(e)
	Professional					
0-02	Engineer, ________					
0-02	Engineer, ________					
0-11	Chemist					
	etc.					
	Subprofessional					
0-X1	Draftsmen					
0-X9	Technician, ________					
0-X9	Technician, ________					
	etc.					
	Administrative					
0-Y1	Accountant					
1-1	Manager, ________					
1-1	Manager, ________					
	etc.					
	Clerical					
2-01	Bookkeeper					
2-11	Typist					
	etc.					
	Skilled Maintenance					
7-71	Carpenter					
7-61	Electrician					
	etc.					

Instructions for Completing the Manpower Survey Schedule

1 and 2. The full name and address of the establishment. Please correct if necessary.

3. If the report includes employees in a branch or subsidiary office other than that located at the address indicated above, its (their) name(s) and location(s) should be listed.

4. A short description of the principal activity of the establishment, such as manufacturing paints, servicing automobiles, mining coal, etc.

5. The total number of employees who worked full time during the specified time. Do not include part-time workers or unpaid family workers.

6. Name and title of person making this report.

7. Name of interviewer and date information was obtained.

8. The occupations listed are those which are considered to be of major importance for the economic development of (country) . This basic listing may not include all high-level and skilled occupations utilized by the establishment. If there are other occupations in the firm which are not shown on the listing and which require at least 2 years of preparation, enter them in the blank lines provided and indicate the number of people working in these occupations.

Some occupations have certain areas of specialties which require different types of training. In order to aid in the analysis of the national manpower inventory program, use specific terms in describing such occupations as engineer, chemist, and technician. For example, for engineers, write in the word "chemical" after "engineers" in the blank provided.

Please do not overstate the description of an occupation. For example, do not write "accountant" for "bookkeeper," "engineer" for "motor vehicle mechanic," or "chemist" for "laboratory assistant."

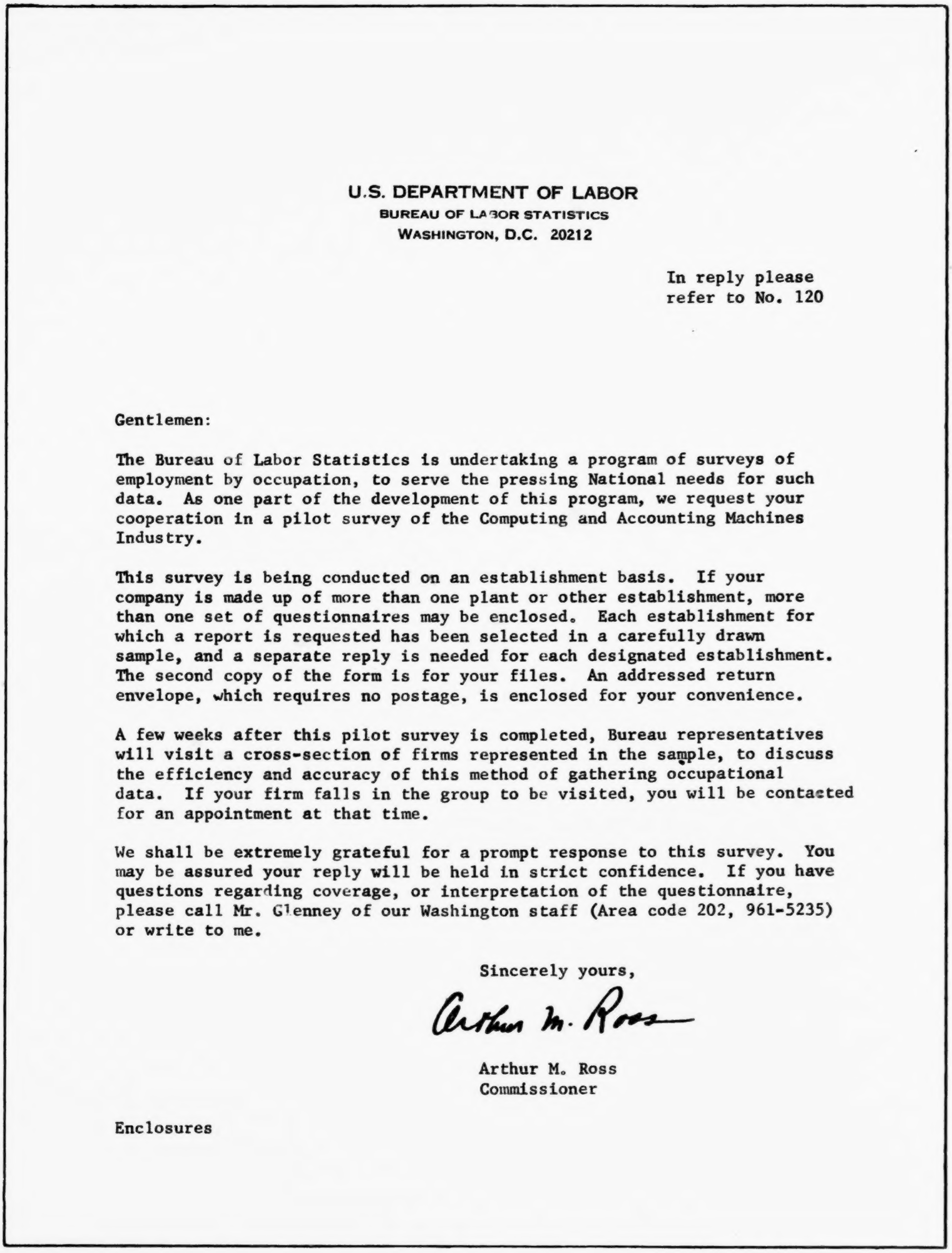
Column a: Enter the total number of workers now employed in each occupation. Do not include trainees or apprentices. If there are no employees in the occupation, enter none or zero.

Columns b and c: Indicate in the appropriate columns the number of men and women in each occupation. Horizontally, they should add to the number in column a.

Column d: Indicate the lowest and the highest basic pay (before deductions). Do not include overtime pay. bonuses, or food and housing allowances. Use the following symbols to designate the pay period: A-annual, M-monthly, W-weekly, and H-hourly.

Column e: For each occupation listed, enter the number of apprentices or trainees currently receiving training.

APPENDIX F-2



U.S. DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS
WASHINGTON, D.C. 20212

In reply please
refer to No. 120

Gentlemen:

The Bureau of Labor Statistics is undertaking a program of surveys of employment by occupation, to serve the pressing National needs for such data. As one part of the development of this program, we request your cooperation in a pilot survey of the Computing and Accounting Machines Industry.

This survey is being conducted on an establishment basis. If your company is made up of more than one plant or other establishment, more than one set of questionnaires may be enclosed. Each establishment for which a report is requested has been selected in a carefully drawn sample, and a separate reply is needed for each designated establishment. The second copy of the form is for your files. An addressed return envelope, which requires no postage, is enclosed for your convenience.

A few weeks after this pilot survey is completed, Bureau representatives will visit a cross-section of firms represented in the sample, to discuss the efficiency and accuracy of this method of gathering occupational data. If your firm falls in the group to be visited, you will be contacted for an appointment at that time.

We shall be extremely grateful for a prompt response to this survey. You may be assured your reply will be held in strict confidence. If you have questions regarding coverage, or interpretation of the questionnaire, please call Mr. Glenney of our Washington staff (Area code 202, 961-5235) or write to me.

Sincerely yours,

Arthur M. Ross

Arthur M. Ross
Commissioner

Enclosures

BLS No. 2871

Budget Bureau No. 44-6619
Approval Expires November 30, 1966

U.S. DEPARTMENT OF LABOR
Bureau of Labor Statistics

(Change address if incorrect and enter ZIP code)

A SURVEY OF EMPLOYMENT IN SELECTED OCCUPATIONS IN THE COMPUTING AND ACCOUNTING MACHINES INDUSTRY: 1966

INSTRUCTIONS: One copy of each questionnaire received should be completed and returned to the Bureau of Labor Statistics. Data should apply, if possible, to the pay period which includes August 12, 1966. Please complete all of the items on this page and if you employ any persons in the listed occupations on page 2, please enter the numbers on the appropriate lines. Reasonable estimates will be satisfactory. Enter "O" where appropriate.

Please classify your workers by occupation according to the accompanying definitions, regardless of job titles used in your establishment. Working foremen and working supervisors (those spending 20 percent or more of their time at tasks similar to those of employees under their supervision) should be included in the count for the occupations with which they are identified. Nonworking production and maintenance supervisors should be counted as foremen; nonworking clerical supervisors should be tallied with "Other clerical workers." In addition to regular full-time workers, include in the employment in each occupation part-time workers, handicapped workers, learners and beginners, probationary workers, temporary workers, and others with unusual rates of pay if they are performing the tasks essential to the work covered in the basic descriptions of the given occupations.

Include in the total on page 1, but exclude from the occupational breakdown on page 2 the following: Executives, administrators, and managers above the foreman level; professional and technical employees; and force-account construction workers (those engaged in new construction and major additions or alterations and who are utilized as a separate work force).

Information supplied on this form will be seen only by sworn employees of the Bureau of Labor Statistics. Only statistical summaries that preserve the confidentiality of the data supplied will be released. Mail completed questionnaire to:

COMMISSIONER OF LABOR STATISTICS
U.S. DEPARTMENT OF LABOR
WASHINGTON, D.C. 20212

CURRENT PRODUCTS. Identify the principal products manufactured in the establishment in 1965 and the proportion of total revenue attributable to each:

Product	Proportion of annual revenue (include rental income) in 1965

TOTAL EMPLOYMENT (include all employees who worked or received pay for any part of the pay period) **IN THE ESTABLISHMENT AS OF THE PAY PERIOD WHICH INCLUDES August 12, 1966;** (a reasonable approximation will be satisfactory): ______________________

PERSON TO BE ADDRESSED IF QUESTIONS ARISE CONCERNING THIS REPORT (Please print or type):

Name ______________________ Title ______________________

Address ______________________ Phone ______________________
Street, City, State, and Zip Code

OCCUPATIONAL EMPLOYMENT

BLS office code	Selected occupations and grades (See accompanying definitions)	Number of workers
	Total Clerical Workers (Include both office and plant clerical workers)	
	Accounting Clerk..................................	
	Bookkeeping Machine Operator..................	
	Office Machine Operator (Other than bookkeeping)	
	Payroll and/or Timekeeping Clerk................	
	Secretary..	
	Shipping and Receiving Clerk....................	
	Stenographer......................................	
	Stock Clerk (Storekeeper).........................	
	Typist...	
	Other Clerical Workers............................	
	Office Machine Salesmen (Other than engineers)	
	Total Skilled Trades and Other Manual Occupations..................	
	Assembler, Class A................................	
	Assembler, Class B................................	
	Assembler, Class C................................	
	Electrician...	
	Electroplater.......................................	
	Electroplater Helper...............................	
	Filer, Grinder, and Polisher......................	
	Foreman (Non-working)............................	
	Heat Treater.......................................	
	Inspector, Class A.................................	
	Inspector, Class B.................................	
	Inspector, Class C.................................	
	Job Setter..	
	Machine-Tool Operator, Class A.................	
	Machine-Tool Operator, Class B.................	
	Machine-Tool Operator, Class C.................	
	Machinist...	
	Mechanics and Servicemen	
	Office Machine Serviceman......................	
	Other Mechanics and Repairmen................	
	Painter, Maintenance..............................	
	Painter, Production................................	
	Patternmaker, Metal and Wood..................	
	Power Trucker......................................	
	Stationary Engineer...............................	
	Tester, Class A....................................	
	Tester, Class B....................................	
	Tester, Class C....................................	
	Tool and Die Maker................................	
	Welder, Machine (Resistance)..................	
	Welder, Hand.......................................	
	Wireman, Class A..................................	
	Wireman, Class B..................................	
	Wireman, Class C..................................	
	Other Skilled Trades and Manual Occupations..................	
	Service Workers....................................	

APPENDIX F-2

DEFINITIONS TO BE USED IN REPORTING EMPLOYMENT BY OCCUPATION IN THE COMPUTING AND ACCOUNTING MACHINES INDUSTRY

TOTAL CLERICAL WORKERS

Includes occupations concerned with the preparation, transcribing, transferring, systemizing, or preserving of written communications and records in offices, shops, and other places of work where such functions are performed.

ACCOUNTING CLERK

Performs a variety of routine calculating, posting, and typing duties to accomplish accounting: Posts details of business transactions, such as allotments, disbursements, deductions from payrolls, pay and expense vouchers, remittances paid and due, checks, and claims. Totals accounts, using adding machine. Computes and records interest charges, refunds, cost of lost or damaged goods, freight or express charges, rentals and similar items. May type vouchers, invoices, account statements, payrolls, periodic reports, and other records. May be designated according to type of accounting performed as, for example, Accounts-Payable Clerk or Accounts-Receivable Clerk.

BOOKKEEPING MACHINE OPERATOR

Operates a bookkeeping machine (Remington Rand, Olivetti Underwood, Burroughs, National Cash Register, Monroe, International Business Machines, R. C. Allen, with or without a typewriter keyboard) to keep a record of business transactions. Keeps a set of records and determines proper record and distribution of debit and credit items to be used in each phase of the work, and/or keeps a record of one or more phases or sections of a set of records. Phases or sections include accounts payable, payroll, customers' accounts, cost distribution, expense distribution, inventory control, etc. He may prepare consolidated reports, balance sheets, and other records by hand, and he may check or assist in preparation of trial balances and prepare control sheets for the accounting department. This classification does not include workers who use a bookkeeping machine primarily to prepare customers' bills as a part of the accounts receivable operation.

OFFICE MACHINE OPERATOR (OTHER THAN BOOKKEEPING)

Includes all persons, other than bookkeeping machine operators (defined above), whose principal duty is operating an office machine, e.g., calculating machine operator, duplicating machine operator, addressing machine operator, tabulating machine operator, check writing machine operator, keypunch operator.

PAYROLL AND/OR TIMEKEEPING CLERK

Computes wages of company employees and enters the necessary data on the payroll sheets, or keeps a daily record showing time of arrival on the job and departure from work of company employees. **Payroll work involves:** Calculating workers earnings based on time or production records; and posting calculated data on payroll sheet, showing information such as worker's name, working days, time, rate, deduction for insurance, and total wages due. May make paychecks and assist paymaster in making up and distributing pay envelopes. May use a calculating machine. **Timekeeping work involves:** The filling out of timesheets and time cards, or supervising the use of time clocks, depending on the system used for recording the hours of work. Periodically computing total time worked by each employee as a basis for making up payroll. May involve additional duties such as keeping records of materials used and their cost, and notifying workers when to report to work.

SECRETARY

Performs secretarial and clerical duties for a superior in an administrative or executive position. Duties include making appointments for superior; receiving people coming into office; answering and making phone calls; handling personal and important or confidential mail, and writing routine correspondence on own initiative; and taking dictation (where transcribing machine is not used) either in shorthand or by stenotype or similar machine, and transcribing dictation or the recorded information reproduced on a transcribing machine. May prepare special reports or memoranda for information of superior.

SHIPPING AND RECEIVING CLERK

Prepares merchandise for shipment, or receives and is responsible for incoming shipments of merchandise or other materials. **Shipping work involves:** A knowledge of shipping procedures, practices, routes, available means of transportation, and rates; and preparing records of the goods shipped, making up bills of lading, posting weight and shipping charges, and keeping a file of shipping records. May direct or assist in preparing the merchandise for shipment. **Receiving work involves:** Verifying or directing others in verifying the correctness of shipments against bills of lading, invoices, or other records; checking for shortages and rejecting damaged goods; routing merchandise or materials to proper departments; and maintaining necessary records and files.

STENOGRAPHER

Primary duty is to take dictation involving a normal routine vocabulary, or a varied technical or specialized vocabulary such as in legal briefs or for reports on scientific research from one or more persons either in shorthand or by stenotype or similar machine; and transcribe dictation. May also type from written copy. May maintain files, keep simple records, or perform other relatively routine clerical tasks. May operate from a stenographic pool. **Does not include transcribing-machine work.**

STOCK CLERK (Storekeeper)

Receives, stores, and issues equipment, material, merchandise, or tools in a stockroom or storeroom. Work involves a combination of the following: Checking incoming orders; storing supplies; applying identifications to articles; issuing supplies; taking periodic inventory or keeping perpetual inventory; making up necessary reports; requesting or ordering supplies when needed. **Stock room laborers, tool crib attendants, and nonworking supervisors of stock clerks and laborers are excluded.**

TYPIST

Uses a typewriter to make copies of various material or to make out bills after calculations have been made by another person. May include typing of stencils, mats, or similar materials for use in duplicating process. May operate duplicating machine to reproduce copy. May also perform relatively routine tasks, such as verifying totals on bills and report forms, keeping simple records, filing records and reports, or sorting and distributing mail. May be designated according to material typed as Stencil Cutter, Tabular Typist.

OTHER CLERICAL WORKERS

Includes all clerical workers not previously defined; e.g., cashier, file clerk, mail clerk, personnel clerk, expeditor, production clerk, office boy, and nonworking clerical supervisors (those spending less than 20 percent of their time at tasks similar to those of employees under their supervision).

OFFICE MACHINE SALESMAN

Calls at industrial, commercial and other establishments to sell products. May rent or lease machines to customers. May be designated according to type of machine sold, as Salesman, Adding Machine; Salesman, Bookkeeping-and Accounting Machine; Salesman, Computing Machine. This classification does **not** include sales positions which require professional engineering knowledge sufficient to make judgments involving engineering and economic principles and calculations of a degree of complexity which require knowledge equivalent, at least, to that acquired through completion of a 4-year college course with a major in engineering or science.

SKILLED TRADES AND OTHER MANUAL OCCUPATIONS

Includes: (1) All skilled craft occupations; e.g., machinists, tool and die makers, electroplaters, electricians, class A inspectors, class A machine tool operators; (2) all semiskilled machine and manual occupations; e.g., truckdrivers, class B and C inspectors, and class B and C machine tool operators; and (3) all unskilled manual occupations; e.g., electroplater helpers, laborers, and hand truckers.

ASSEMBLER (Bench assembler; floor assembler; jig assembler; line assembler; subassembler)

Assembles and/or fits together parts to form complete units or subassemblies at a bench, conveyor line, or on the floor, depending upon the size of the units and the organization of the production process. Work may include processing operations requiring the use of hand tools in scraping, chipping, and filing of parts to obtain a desired fit, as well as power tools and special equipment when punching, riveting, soldering or welding of parts is necessary. **Workers who perform any of these processing operations exclusively as part of specialized assembling operation are excluded. Also excluded are Wiremen - considered to be a separate classification.**

Class A. Assembles parts into complete units or sub-assemblies that require fitting of parts and decisions regarding proper performance of any component part of the assembled unit. **Work involves any combination of the following:** Assembling from drawings, blueprints, or other written specification; assembling units composed of a variety of parts and/or subassemblies; assembling large units requiring careful fitting and adjusting of parts to obtain specified clearances; using a variety of hand and power tools and precision measuring instruments.

Class B. Assembles parts into units or sub-assemblies in accordance with standard and prescribed procedures. **Work involves any combination of the following:** Assembling a limited range of standard and familiar products composed of a number of small or medium-sized parts requiring some fitting or adjusting; assembling large units that require little or no fitting of component parts; working under conditions where accurate performance and completion of work within set time limits are essential for subsequent assembling operations; using a limited variety of hand or powered tools.

Class C. Performs short-cycle, repetitive assembling operations. Work does **not** involve any fitting or making decisions regarding proper performance of the component parts or assembling procedures.

ELECTRICIAN

Performs a variety of electrical trade functions such as the installation, maintenance, or repair of equipment for the generating, distribution, or utilization of electric energy in an establishment. **Work involves:** Installing or repairing any of a variety of types of electrical equipment such as generators, transformers, switchboards, controllers, circuit breakers, motors, heating units, conduit systems, or other transmission equipment; working from blueprints, drawings, layout or other specifications; locating and diagnosing trouble in the electrical system or equipment; working standard computations relating to load requirements or wiring or electrical equipment; and using a variety of electrician's hand tools and measuring and testing instruments.

ELECTROPLATER

Covers metal objects electrolytically with a coating of nickel, chromium, cadmium, or other metal to provide the objects with a corrosion-protective coating, to build up worn surfaces, or for other purposes. **Work involves:** Preparing article for plating by dipping it in cleaning solution, or by scouring it; covering with lacquer, or with rubber or plastic tape, any part of the article which is not to be plated; placing the article in the plating tank; regulating electric controls to maintain the desired intensity of electricity flowing through the plating solution; removing the object from the tank and rinsing it in water. The strength of the plating solution, amount of electric current used, thickness of plate, size of objects to be plated, size of electrodes, and length of immersion are interrelated factors taken into account in the plating process by the worker. He may dry the object by hanging it in air or rolling it in sawdust; he may mix the plating solution; and he may fabricate the rack for holding the article to be plated.

ELECTROPLATER HELPER

Assists the electroplater by performing any of the following duties: Cleaning electroplating tanks; placing metal articles to be electroplated on racks; cleaning racked articles by dipping them into a chemical solution; placing cleaned articles in plating tank and removing them after the plating process; rinsing plated articles in clean water; or drying articles by hanging them in a hot-air drying box or by rolling them in sawdust.

FILER, GRINDER, AND POLISHER

Smoothes, cleans, abrades, or finishes rough spots, burrs or marred surfaces, manually, chemically, or with portable or nonportable machine to facilitate further processing of, or to produce lustrous finish on, metallic or nonmetallic stock. Generally specializes in one or a combination of the following tasks: Cleans off projections or excess metal, or rough finishes stock by holding it against rotary abrasive wheel which is mounted on the shaft of a stationary or portable electric motor, or driven by compressed air; buffs parts to a high, smooth polish, selecting appropriate polishing wheel (wire, felt, abrasive cloth, etc.) and dressing it with tallow or other dressing compounds. May polish areas inaccessible to machine by hand with emery cloth. May clean parts in chemicals preparatory to polishing. Removes burrs and sharp edges from machined stock with files, scrapers, or other hand tools.

FOREMAN (Non-working)

Supervises workers engaged in one or several occupations; interprets blueprints, sketches, and written or verbal orders; determines procedures of work; assigns duties to workers and inspects their work for quality and quantity; maintains harmony among workers; may keep time, production, and other clerical records; employ, train and discharge workers; assist subordinates during emergencies or as a regular assigned duty; set up or inspect equipment preparatory to regular operations; and perform related duties of supervisory or minor administrative nature. This classification does **not** include working foremen (those spending 20 percent, or more, of their time at tasks similar to those of employees under their supervision).

HEAT TREATER

Alters the physical qualities or structure of metals or alloys in the solid state by controlled heating and cooling to obtain desired physical characteristics. **Work involves any combination of the following:** Considerable judgment in the application of heat treating methods and techniques where a high degree of control is necessary to obtain the desired physical characteristics; knowledge of the physical properties of various metals to be treated; knowledge of the characteristics of furnaces, mechanical or electrical control mechanisms, and quenching mediums; and ability to work with a minimum of supervision in a variety of metals. Heat treaters may also be solely engaged in heating objects according to prescribed procedures where a limited degree of control is necessary to obtain desired physical characteristics, and duties may in some cases be limited to feeding identical units into a furnace and maintaining temperature of furnace within prescribed limits. The heating may be accomplished in a variety of different types and sizes of furnaces or other heating devices, and the cooling also may be accomplished by a variety of quenching methods or other types of cooling. Some common types of heat treating are known as hardening, tempering, annealing, normalizing, carburizing or cementation, casehardening, cyaniding, and nitriding.

INSPECTOR

Inspects parts, products, and/or processes. Performs such operations as examining parts or products for flaws and defects, checking their dimensions and appearance to determine whether they meet the required standards and specifications.

Class A. Responsible for decisions regarding the quality of the product and/or operations. **Work involves any combination of the following:** Thorough knowledge of the processing operations in the branch of work to which he is assigned, including the use of a variety of precision measuring instruments; interpreting drawings and specifications in inspection work on units composed of a large number of component parts; examining a variety of products or processing operations; determining causes of flaws in products and/or processes and suggesting necessary changes to correct work methods. This classification does **not include** technicians actually engaged in technical work at a level which requires knowledge of engineering, mathematical, physical, and life sciences comparable to knowledge acquired through technical institutes, junior colleges, or other formal post-high school training.

Class B. Work involves any combination of the following: Knowledge of processing operations in the branch of work to which he is assigned, limited to familiar products and processes or where performance is dependent on past experience; performing inspection operations on products and/or processes having rigid specifications, but where the inspection procedures involve a sequence of inspection operations, including decisions regarding proper fit or performance of some parts; using precision measuring instruments.

Class C. Work involves any combination of the following: Short-cycle, repetitive inspection operations; using a standardized, special-purpose measuring instrument repetitively; visual examination of parts or products, rejecting units having obvious deformities or flaws.

JOB SETTER

Sets-up a variety of machine tools, such as gear hobbers, lathes, milling machines, boring machines, and grinders, for other workers. Changes work cutting tools, and adjusts cutting speeds, feed rates, and depth of cut. May specialize in set-up of single type of machine and be designated accordingly, as Honing-Machine Set-Up Man. May instruct new workers in machine operation. May also set-up machines and equipment other than machine tools, such as welding machines and flame-cutting equipment.

MACHINIST

Carries through to completion the construction and repair of metal parts, tools, and machines. **Work involves:** Interpreting written instructions and specifications; planning and laying out of work; using a variety of machinist's handtools and precision measuring instruments; setting up and operating standard machine tools; shaping metal parts to close tolerances; making standard shop computations relating to dimensions of work, tooling feeds, and speeds of machining; selecting standard materials, parts, and equipment required for his work; and fitting and assembling parts into mechanical equipment. In general, the machinist' work normally requires a knowledge of the working properties of the common metals and rounded training in machine-shop practice. May be designated according to type of activity, as Machinist, Maintenance; Machinist, Production; or according to location, as Machinist, Floor.

MACHINE-TOOL OPERATOR

Operates one or more nonportable, power-driven machine tools in order to shape metal by progressively removing portions of the stock in the form of chips or shavings, or by abrasion. The following are examples of the types of machine-tools covered by this classification:

Automatic lathes
Boring machines
Drill presses, radial
Drill presses, single-or multiple-spindle
Engine lathes
Gear-cutting machines
Gear-finishing machines
Grinding machines
Milling machines
Planers
Screw machines, automatic
Screw machines, hand
Shapers
Turret lathes, automatic
Turret lathes, hand

Class A. Sets up machines, by determining proper feeds, speeds, tooling and operation sequence or by selecting those prescribed in drawings, blueprints, or lay-outs; makes necessary adjustments during operation where changes in work and setup are relatively frequent and where care is essential to achieve requisite dimensions of very close tolerances.

Class B. Sets-up machines on standard or roughing operations where feeds, speeds, tooling, and operation sequence are prescribed or maintains operation set-up made by others; makes all necessary adjustments during operation where care is essential to achieve very close tolerances or where changes in product are relatively frequent.

Class C. Operates machine on routine and repetitive operations; makes only minor adjustments during operations; when trouble occurs stops machine and calls foreman, leadman, or set-up man to correct the operation .

MECHANICS AND SERVICEMEN

OFFICE-MACHINE SERVICEMAN

Repairs and services office machines such as adding and calculating machines, using hand tools, power tools, micrometers, and welding equipment. Operates machines to test moving parts and to listen to sounds of machines to locate causes of trouble. Disassembles machines and examines parts such as gears, guides, rollers, and pinions for wear and defects, using micrometers. Repairs, adjusts or replaces parts, using hand tools, power tools, and soldering and welding equipment. Cleans and oils moving parts. May give instructions in operation and care of machines to machine operators. May assemble new machines. May be designated according to machine repaired or serviced, as Adding-Machine Serviceman, Calculating-Machine Serviceman, Cash Register Serviceman.

OTHER MECHANICS AND REPAIRMAN

Includes all mechanics and repairmen, not previously defined, whose primary duty is repairing machinery, equipment, or buildings; e.g., Instrument Repairmen, Motor Vehicle Mechanics and Repairmen, Air-Conditioning, Heating, and Refrigeration Mechanics and Repairmen, Elevator Repairmen, Maintenance Men. This classification excludes: (1) Repairmen regularly required to produce replacement parts of some complexity (see Machinist definition), and (2) Technicians actually engaged in technical work at a level which requires knowledge of engineering, mathematical, physical, and life sciences comparable to knowledge acquired through technical institutes, junior colleges, or other formal post-high school training.

PAINTER, MAINTENANCE

Paints and redecorates walls, woodwork, and fixtures of an establishment. **Work involves the following:** Knowledge of surface peculiarities and types of paint required for different applications; preparing surface for painting by removing old finish or by placing putty or filler in nail holes and interstices; and applying paint with spray gun or brush. May mix colors, oils, white lead, and other paint ingredients to obtain proper color or consistency.

PAINTER, PRODUCTION

Coats surfaces of manufactured articles with finishing or protective materials such as enamel, lacquer, paint, or stain by dipping, by brush, or by spray gun. **Dipping work involves:** Coating articles by immersing them in a liquid one at a time, or several at a time, in wire baskets by hand or by using a hand-operated hoist; removing excess coating or brushing out heavily coated portions with a brush. **Brush work involves:** Applying rough or finish coats of paint to articles by hand, using a paint brush. **Spray gun work involves:** Coupling gun to air hose and starting compressor, or opening valve on compressed air line; adjusting nozzle of gun by turning adjusting sleeve; squeezing trigger and directing spray over surfaces to obtain smooth, even finish; cleaning gun and hose with solvent. May place articles in revolving holder before spraying. May do two-color work by masking areas with tape to shield them from second coloring.

PATTERNMAKER, METAL AND WOOD

Includes workers making either metal, wood, or metal and wood patterns, core boxes, or metal plates.

The work of a **patternmaker, metal,** involves **most of the following:** Planning and laying out of work from blueprints, drawings, or models; making standard shop computations relating to dimensions of work; using a variety of machine and handtools; and performing hand-finishing operations on patterns by filing, filling in low spots with solder, and sometimes painting with aluminum paint.

The work of a **patternmaker, wood,** involves **most of the following:** Planning and laying out of work from blueprints, drawings, or models; making standard shop computations relating to dimensions of work; using a variety of patternmaker's handtools such as saws, planes, chisels, gages, and mallets; operating various woodworking machines such as band saws, circular saws, borers, routers, lathes, planers, drill presses, sanders, and shapers; checking work with calipers, rules, protractors, squares, straight edges, and other measuring instruments; assembling patterns and sections of patterns by gluing, nailing, screwing, and doweling; working to required tolerances and allowances; and selecting the materials for the construction of a particular pattern. May also make sweeps (templates) for making molds by the sweep-molding method.

POWER TRUCKER

Operates a manually controlled gasoline- or electric-powered truck or tractor to transport goods and materials of all kinds about a warehouse, manufacturing plant, or other establishment.

STATIONARY ENGINEER

Operates and maintains and may also supervise the operation of stationary engines and equipment (mechanical or electrical) to supply the establishment in which employed with power, heat, refrigeration, or air conditioning. **Work involves:** Operating and maintaining equipment such as steam engines, air compressors, generators, motors, turbines, ventilating and refrigerating equipment, steam boilers and boiler-fed water pumps, making equipment repairs; and keeping a record of operation of machinery, temperature, and fuel consumption. May also supervise these operations. This classification excludes: (1) **Head or chief engineers in establishments employing more than one engineer, and** (2) **workers exclusively engaged in the repair of the equipment listed in this definition** (see Electrician and Other Mechanics and Repairmen definitions).

TESTER

Performs tests on products to determine whether the operation and/or characteristics of various parts or products meet required standards and specifications.

Class A. Work involves any combination of the following: Using a wide variety of precision measuring instruments and testing equipment; interpreting drawings and specifications as to operating requirements; testing a wide variety of products or parts. This classification does **not** include technicians actually engaged in technical work at a level which requires knowledge of engineering, mathematical, physical, and life sciences comparable to knowledge acquired through technical institutes, junior colleges, or other formal post-high school training.

Class B. Work involves any combination of the following: Testing products or parts having rigid specifications, but where testing procedures and allowable variations are prescribed; performing repetitive tests which involve a sequence of testing operations; using precision testing equipment.

Class C. Work involves any combination of the following: Short-cycle repetitive testing operations; using a standard or special-purpose testing instrument or test set repetitively; accepting or rejecting units on the basis of prescribed standards.

TOOL AND DIE MAKER

(Diemaker; jig maker; toolmaker; fixture maker; gauge maker)

Constructs and repairs machine-shop tools, gauges, jigs, fixtures, or dies for forgings, punching, and other metal-forming work. **Work involves:** Planning and laying out of work from models, blueprints, drawings or other oral and written specifications; using a variety of tool and die maker's hand tools and precision measuring instruments; understanding of the working properties of common metals and alloys; setting up and operating machine tools and related equipment; making necessary shop computations relating to dimensions of work, speeds, feeds and tooling of machines; heat-treating of metal parts during fabrication as well as of finished tools and dies to achieve required qualities; working to close tolerances; fitting and assembling of parts to prescribed tolerances and allowances; selecting appropriate materials, tools, and processes.

WELDER, MACHINE (RESISTANCE)

Sets up and operates portable or stationary gun-type welding machines. Various welds of this type include spot welds, projection welds, series spot welds, line seam welds, multiple spot welds, flash welds, and butt welds. Applies to machine welding operations in which the heat of the weld is supplied by induction unit.

WELDER, HAND

Fuses (welds) metal objects together by means of gas or arc welding apparatus in the fabrication of metal shapes and in repairing broken or cracked metal objects. In addition to performing welding or brazing operations, the welder may also lay out guidelines or marks on metal parts and may cut metal with a cutting torch.

WIREMAN

Specializes in electrical wiring in the assembly of office machines.

Class A. Wires large units requiring multiple wiring. **Work involves most of the following:** Working from blueprints or drawings; planning of wiring procedures on a variety of units; selecting wires and other materials required for the work; determining necessary lengths of wires and cutting them; testing completed wiring with instruments to determine adequacy of performance.

Class B. Performs multiple wiring installations on a repetitive basis. **Work involves most of the following:** Working from drawings relating to the particular wiring on which he has had instruction and training; wiring in accordance with prescribed writing procedures; using standard wires prepared for the work by others; checking wiring.

Class C. Performs short-cycle and repetitive wiring operations. **Work involves most of the following:** Wiring a limited phase of the entire wiring system, on an assembly line basis, or installing simple single wiring; working in accordance with strictly prescribed wiring procedures; using prepared wires or working with wires that are identified by colors; having no responsibility for testing the performance of any phase of the wiring.

OTHER SKILLED TRADES AND OTHER MANUAL OCCUPATIONS

Includes all skilled, semiskilled, and unskilled machine and manual occupations not previously defined; e.g., carpenters, truck drivers, laborers.

SERVICE WORKERS

Includes those occupations concerned with the performance of services for persons that require either direct contact or close association with the individual; occupations concerned with the protection of individuals, or of public or private property; occupations related to the cleaning of the interior and equipment of buildings, offices, stores, and similar places; and occupations concerned with the moving or carrying of equipment, baggage, and other articles. Typical examples are: Waiters, kitchen supervisors, cooks, watchmen, guards, janitors, and elevator operators.

Bibliography

GENERAL

Collins, J. Lawton. "The Development of Human Resources in a Developing Economy," Advanced Management Journal, Vol. 30, No. 3, July 1965, pp. 13-23.

Harbison, Frederick, and Charles A. Myers. Education, Manpower, and Economic Growth: Strategies of Human Resource Development, New York, McGraw-Hill Book Co., Inc., 1964, 229 pp.

_____. Manpower and Education, Country Studies in Economic Development. New York, McGraw-Hill Book Co., 1965, 343 pp.

Hilliard, John F. "Essentials of Manpower Planning in Economic Development," International Development Review, Vol. 4, No. 1, March 1962, pp. 9-13.

"International Flows of Students," Policy Conference on Economic Growth and Investment in Education, Vol. 5, Organisation for Economic Co-operation and Development, Paris, 1962, 41 pp.

International Labour Office. International Differences in Factors Affecting Labour Mobility - Inter-industry, Occupational and Geographical, processed, Geneva, 1965, 201 pp.

_____. Report of the Meeting of Experts on the Assessment of Manpower and Training Requirements for Economic Development, 153d sess., 7th item of the agenda, Geneva, October 1962.

Layard, P. R. C., and Saigal, J. C., "Educational and Occupational Characteristics of Manpower, an International Comparison," British Journal of Industrial Relations, Vol. 4, July 1966, pp. 222-226.

Maddison, Angus. Contribution of Foreign Skills, Training and Technical Assistance to Economic Development. Organisation for Economic Co-operation and Development, Centre Studies No. 3. Paris, April 1965.

_____. The Supply of High-Level Skills and Training to Developing Countries. Organisation for Economic Co-operation and Development. Paris, June 30, 1964.

Mouly, Jean. "Human Resources Planning as Part of Economic Development Planning," International Labour Review, Vol. 92, No. 3, September 1965, pp. 184-207.

Parnes, Herbert S., editor. Planning Education for Economic and Social Development, Organisation for Economic Co-operation and Development. Paris, 1962, 270 pp.

Paukert, F. "The Interdependence of High-Level Manpower Planning and Economic Planning," International Labour Review, Vol. 89, No. 4, April 1964, pp. 339-352.

Prandy, Kenneth, Professional Employees, A Study of Scientists and Engineers. London, Faber and Faber, Ltd., 1965.

Schultz, Theodore W. "Investment in Human Capital," American Economic Review, March 1961, pp. 1-17.

Sturmthal, Adolf. Current Manpower Problems: An Introductory Survey, Urbana, University of Illinois, February 1964.

Williams, R. L. The Supply of Essential Skills in Less Developed Countries. Jamaica, 1965, 84 pp.

United Nations. Economic Characteristics of International Migrants: Statistics for Selected Countries, 1918-1954. (ST/SOA/SER-A/12), New York, 1958.

U.S. Department of Health, Education, and Welfare, Social Security Administration, Social Security Programs Throughout the World, 1964, Government Printing Office, Washington, 1964, 223 pp.

U.S. Department of Labor, Bureau of International Labor Affairs, Washington. DOLITAC Staff Papers.
- Item 1. Raymond Larson Mission to Brazil.
- Item 10. Edgar C. McVoy Mission to Thailand.
- Item 12. Vincent R. Faulds Mission to Jamaica.
- Item 13. Richard R. Zoeckler Mission to Vietnam.
- Item 14. Jennings Lee Mission to Central America.

U.S. Department of State, Agency for International Development. Manpower in Social and Economic Development. Proceedings of the Annual International Manpower Seminars, Washington, various years.

METHODOLOGY AND TECHNIQUES

Al-Badry, M. A. "A Sampling Procedure for Mailed Questionnaires," Journal of the American Statistical Association, Vol. 51, 1956, pp. 209-227.

British Honduras. Labour Department. Manual of Instruction for the Manpower Information Programme. Belize City, September 1965.

_____. _____. Standard National Classification of Occupations. Belize City, 1965, 186 pp.

Cochran, William G. Sampling Techniques. New York, John Wiley & Sons, Inc., 1963, 413 pp.

Employment Forecasting Techniques--Forecasting of Active Population by Occupation and Level of Skill. Organisation for Economic Co-operation and Development, Manpower and Social Affairs Committee. Paris, Jan. 18, 1965, 29 pp.

Goldstein, Harold. Methods of Forecasting Demand for and Supply of Scientists. Organisation for European Economic Co-operation. Paris, June 1958, p. 46.

_____, and Sol Swerdloff. Methods of Long-Term Projection of Requirements for and Supply of Professional, Skilled and Other Highly Trained Manpower, India, 1959, 104 pp.

Greenspan, Harry, and Joseph Kilgallon. Occupational Employment Statistics, Sources and Data. U.S. Department of Labor, BLS Report 305, Washington, June 1966, 87 pp.

Hansen, Morris H., William N. Hurwitz, and William G. Madow. Sample Survey Methods and Theory, Vol. I, Methods and Applications, New York, John Wiley & Sons, Inc., 1953, 638 pp.

Human Resources Assessment and Planning: Procedural and Methodological Considerations. Pan American Union, Department of Economic Affairs. Washington, January 1962, 43 pp.

International Labour Office. International Standard Classification of Occupations. Geneva, 1958, 236 pp.

International Seminar on Employment Forecasting Techniques. Organisation for Economic Co-operation and Development. Paris, 1963, 112 pp.

Methodological Meeting on Human Resources. A Methodology for the Analysis of Human Resources. Pan American Union, Department of Scientific Affairs, Report of meeting held at Mexico City, October 14-19, 1963.

Moberg, Sven. "Methods and Techniques for Forecasting Specialized Manpower Requirements," Forecasting Manpower Needs for the Age of Science. Organisation for Economic Co-operation and Development. Paris, 1960.

Parnes, Herbert S. Forecasting Educational Needs for Economic and Social Development. Organisation for Economic Co-operation and Development. Paris, 1962, 113 pp.

Scott, C. "Research on Mail Surveys," Journal of the Royal Statistical Society, Series A, (General) Vol. 124, 1961, pp. 143-205.

Srivastava, R. L. Projecting Manpower Demand, A Review of Methodology. New Delhi, 1964, 53 pp.

"Technical and Scientific Personnel: Methods of Assessing Supply and Demand," International Labour Review, Vol. 81, No. 1, January 1960, pp. 58-73.

United Nations. Statistical Office. Indexes to the International Standard Industrial Classification of all Economic Activities, Statistical Papers, Series M, No. 4, Rev. 1, Add. 1, New York, 1959, 359 pp.

_____. _____. Recommendations for the Preparation of Sample Survey Reports, Series C., No. 1, Rev. 2, New York, 1964.

U.S. Department of Labor, Bureau of Employment Security. Area Skill Survey Handbook on Employment Security Job Market Research Methods. BES No. E-252, Washington, November 1965, 102 pp.

_____. _____. Dictionary of Occupational Titles. Washington, U.S. Government Printing Office, 1965. 2 volumes.

Venezuela. Ministerio del Trabajo. Diccionario Nacional de Ocupaciones, Caracas, 1965, 561 pp.

COUNTRY STUDIES--For additional listings, see appendix A.

AFRICA

Bunker, Charles W. Techniques of Manpower Assessment, Nigeria. Geneva, 1962.

Ghana. Department of Labour, National Employment Service. The Occupational Pattern of Employment in Ghana, 1962. Accra, October 1963, 58 pp.

Harbison, Frederick. "The African University and Human Resource Development," Journal of Modern African Studies, Vol. 3, No. 1, March 1965. pp. 53-62.

Merson, Burnie. "Human Resources for Economic Growth and Social Progress in Tunisia," Report to the U.S. Agency for International Development, May 8, 1961, 75 pp.

_____. "USOM Technical Assistance to Tunisia in High-Level Manpower," Report to the U.S. Agency for International Development. Dec. 22, 1959, 33 pp.

Podesta, Edward A. The Economic Potential of West Cameroon--Priorities for Development, Vol. 7, Menlo Park, Calif., Stanford Research Institute, April 1965, 195 pp.

Tanganyika. Ministry of Development Planning. Survey of High-Level Manpower in Tanganyika. Dar es Salaam, 1962.

ASIA

Brand, W. *Requirements and Resources of Scientific and Technical Personnel in Ten Asian Countries*. U.N. Statistical Reports and Studies, UNESCO, New York, 1960.

DeWitt, Nicholas. *Pakistan's High-Level Manpower and Human Resource Development Planning*. Revised draft of report to U.S. Agency for International Development, February 1965, 65 pp.

Far East Manpower Assessment and Educational Planning Seminar--Proceedings. Philippines National Economic Council and U.S. Agency for International Development. Manila, February 12-17, 1965, 130 pp.

International Labour Office. *Report to the Government of Thailand on Manpower Assessment and Planning*. Geneva, 1965, 22 pp.

Korea. Economic Planning Board. *1963 Survey of Employed Technical Manpower*. Soeul, 1963.

"Manpower Aspects of the Lower Mekong Basin Development Project," *International Labour Review*, Geneva, April 1962, pp. 357-367.

Masulit, Teofilo A. "Supply and Demand of Manpower in the Teaching Profession," *The (Philippine) Statistical Reporter*, Vol. 7, No. 3, Manila, July-September 1963, pp. 7-13.

Pant, Pitambar and M. Vasudevan. *Occupational Pattern in Manufacturing Industries, India 1956*. Planning Commission, Scientific and Technical Manpower and Perspective Planning Division, Delhi, 1959.

"Republic of China Asks Scholars to Return," *Survey of International Development*, Vol. 2, No. 10, Society for International Development, Washington, Oct. 15, 1965, p. 2.

South-East Asia Treaty Organization. *Report of the Expert Study Group on Skilled Labour Requirements of the Asian Member Countries*. Bangkok, May-June 1964, 130 pp.

Sundrum, R. M. *Manpower Resources of Ceylon, 1956-1981*. Ceylon Government Press, 1959, 31 pp.

Thurston, J. L. High-Level Manpower in Korea. Report to the U.S. Agency for International Development, Seoul, Apr. 4, 1960, 11 pp.

Werts, Leo R. *A Manpower Program for Economic Development and Observations and Suggestions Concerning India's Manpower Program*. New Delhi, December

White, Joe. *Manpower Situation in Thailand*. Report to the U.S. Agency for International Development, May 1, 1962, 7 pp.

EUROPE

DeWitt, Nicholas. Education and Professional Employment in the USSR. Russian Research Center, Harvard University, Cambridge, Massachusetts, August 1961, 856 pp.

Resources of Scientific and Technical Personnel in the OECD Area. Organisation for Economic Co-operation and Development. Statistical Report of the Third International Survey on the Demand for and Supply of Scientific and Technical Personnel. Paris, July 1963, 293 pp.

"Special Register for Professional People at the Employment Exchanges," Ministry of Labour Gazette, London, September 1963.

United Kingdom. Advisory Council on Scientific Policy, Committee on Scientific Manpower. Scientific and Technological Manpower in Great Britain: 1962. London, 1963.

LATIN AMERICA

Blitz, Rudolph. High-Level Manpower Inventories and Needs in Relation to Chilean Ten-Year Development. Vanderbilt University, 1963.

Clay, Robert J. Manpower Services for Human Resource Development in El Salvador and the Central American Region. Report to the U.S. Agency for International Development. Sept. 20, 1963.

Colombia. Institute for Advanced Training Abroad, Human Resources Department. Resources and Requirements for Highly Trained Personnel, Colombia: 1964-1975. Bogota, 1966, 34 pp.

Colombia. Servicio Nacional de Aprendizaje. Informe Sobre Necesidades de Mano de Obra Calificada en Colombia. Bogota, 1959.

Ducoff, Louis J. Los Recursos Humanos de Centro America, Panama y Mexico, en 1950/80 y sus Relaciones con Algunos Aspectors del Desarrollo Economico. Mexico, 1960.

Gutierrez Olivos, Sergio and Jorge Riquelme Perez. La Emigracion de Recursos Humanos de Alto Nivel y el Caso de Chile. Union Panamericana, Departamento de Asumtos Cientificos, Washington, 1965, 59 pp.

Horowitz, Morris A. La Emigracion de Profesionales y Tecnicos Argentinos. Editional del Instituto Torcuato di Tella, Buenos Aires, 1962.

Instituto Torcuato di Tella, Centro de Investigaciones Economicas. Los Recursos Humanos de Nivel Universitario y Tecnico en la Republica Argentina. Buenos Aires, 1963, 2 vols.

McCusker, Henry F. Jr., and Edward A. Podesta. Manpower and Educational Planning in the Socio-Economic Development of Ecuador. Junta Nacional de Planificacion y Coordinacion Economica and Stanford Research Institute, Menlo Park, 1964.

Myers, Charles N. Education and National Development in Mexico. Industrial Relations Section, Department of Economics, Princeton University, Princeton, New Jersey, 1965, 147 pp.

Oferta y Demanda de Recursos Humanos en Centroamerica. Consejo Superior Universitario Centroamerica (CSUCA), Ciudad Universitaria, Costa Rica, 1966. 6 vols.

Oteiza, Enrique. The Engineering Profession and Economic Development in Argentina. Geneva, Dec. 12-18, 1963.

Pauling, Norman G. Population, Labor Force and Employment in Panama. Report to the U.S. Agency for International Development. January 1965, 66 pp.

Roney, Don H. Report on High-Level Manpower in Mexico. Report to the U.S. Agency for International Development. June 20, 1960, 27 pp.

Sanders, Donald P. A Feasibility Assessment of Human Resource Development Planning in Bolivia. Report to the U.S. Agency for International Development. La Paz, 1965, 23 pp.

Solem, Arnie. Interim Report on Manpower Planning and Human Resource Development in the Dominican Republic. Report to the U.S. Agency for International Development. July 23, 1963, 31 pp.

NEAR EAST

Harbison, Frederick, and I. A. Ibrahim. Human Resources for Egyptian Enterprise. New York, McGraw Hill Book Co., Inc., 1958, 230 pp.

Hussein, H. M. Techniques of Manpower Assessment and their Implications for Development Plan in the UAR. Geneva, 1962.

International Labor Office. Report to the Government of the Syrian Arab Republic on Manpower Assessment and Planning. Geneva, 1964, 17 pp.

Israel. Ministry of Labor, Manpower Planning Authority. Manpower Surveys: Women in the Labour Force. Tel-Aviv, March 1966, 95 pp.

Keenan, E. L. Manpower in Jordan. Report to the U.S. Agency for International Development, 1965, 8 pp.

Saks, John I. and Edgar C. McVoy. Techniques of Manpower Assessment, Paper for U.N. Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas. Geneva, 1962.

Shurcliff, Alice W. Manpower in Cukurova. Jan. 10, 1964, 11 pp.

_____, and Omer Kipmen. Methodology for Estimating Population and Labor Force in Sub-National Regions of Turkey. Jan. 10, 1964.

UNITED STATES AND PUERTO RICO

Blank, David and George J. Stigler. The Demand and Supply of Scientific Personnel. New York, National Bureau of Economic Research, 1957, 200 pp.

Puerto Rico. Committee on Human Resources. Puerto Rico's Manpower Needs and Supply. San Juan, 1957, 134 pp. Also in Spanish.

U.S. Department of Labor, Bureau of Labor Statistics. Technician Manpower: Requirements, Resources, and Training Needs by Neal H. Rosenthal, Bulletin 1512, Washington, 1966, 111 pp.

_____. _____. Working Paper on the Supply of Scientists and Engineers in the United States, 1962-1970. June 30, 1964, 42 pp.

U.S. National Science Foundation, Office of Economic and Manpower Studies, Scientific and Technical Manpower Resources. Washington, 1965, 184 pp.

☆ U. S. GOVERNMENT PRINTING OFFICE : 1968 O - 299-737